A
COMPLETE TREATISE
ON
PRACTICAL ARITHMETIC;
AND
BOOK-KEEPING,

Adams 7.79.2

BOTH BY

SINGLE AND DOUBLE ENTRY.

ADAPTED TO THE USE OF SCHOOLS.

THE NINTH EDITION.

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PREFACE.

TO adapt this work to the eaſy uſe of preceptors, I have every where delivered the definitions and rules in as brief a manner as poſſible, to make them, at the ſame time, general, and free from the abſurdity and nonſenſe which commonly attend definitions in works of this kind; and have added ſuch notes after them, as deſcribe ſome particulars not eſſential to the general rules themſelves, but tend either to explain them or to facilitate the operations; alſo, to each rule there is annexed a great variety of the beſt examples, with their anſwers; and where the common method of ſetting down the operations did not pleaſe me, I have there inſerted the work of an example, at large, in the method which I think moſt convenient.

The operations of addition, ſubtraction, multiplication, and diviſion, are delivered, firſt in ſimple numbers, and afterwards in compound; thinking *that* the propereſt order in which they can be taught. But I would not be underſtood to mean, that it is always neceſſary to have theſe, or any other of the rules, copied into the pupil's book in the very order in which they are inſerted; for they are all delivered in ſuch manner as to have little or no dependence on each other, that they may be taught in what order every maſter chooſes: nor that it is ever neceſſary to copy out the firſt ſimple rules; but if any maſter chooſe to do it, I would adviſe him to make his ſcholars run over theſe firſt upon their ſlate or waſte paper; then begin them again, and write them, with an example or two to each, in their book: and thus he may with eaſe mix the ſimple and compound rules together. Alſo, though I have inſerted little or nothing ſuperfluous in any of the problems or general rules, the judicious teacher may omit any notes, or particular caſes he may think fit. And if all the pupils have printed books, as they ought, then they may either write all the rules and examples in their books, or they may omit the rules and notes, and ſet down only the work of their examples, eſpecially where the rules are long and tedious to write. Theſe advantages, together with that of having the book always about them, to get off any precepts or tables when they are out of ſchool, will fully repay them the ſmall expence of the book. It is alſo a good practice in ſome preceptors, to procure parcels of theſe books interleaved with writing paper, and bound up, for their pupils to enter their examples in, after they are calculated; as by giving to every one of them a copy ſo bound, the expence of a large paper book is ſaved, as well as the trouble of writing out the rules, &c. I muſt here alſo caution ſome maſters againſt that fooliſh method of writing down the rules and examples for their pupils, eſpecially in addition and ſubtraction, both of integers and decimals; for, in theſe rules, this is often the only difficulty, and the beſt part of his exerciſe; and on this account I have given moſt of the queſtions in a form different from that in which they commonly are propoſed.

Reduction is placed before the rules of addition, ſubtraction, multiplication, and diviſion of compound numbers; becauſe, in my opinion, compound addition is beſt performed by it; and in compound diviſion it is abſolutely neceſſary. But every one may teach them in what order he ſhall think fit; for the tables of money, weights, and meaſures, may be as conveniently inſerted in compound addition as in reduction, if they be copied at all in any part; which, however, I think is needleſs, and only waſting time, eſpecially if the ſcholar has a printed book: alſo, if any maſters chooſe to make their pupils write their tables, but not in the form they here ſtand, they may eaſily cauſe them to turn theſe tables into the common form upon a ſlate, or waſte paper, and copy them from thence into their books; and this will be no bad exerciſe for them.

In the rule-of-three, I have neglected the common diſtinction of it into direct and inverſe; and have given one general rule for the ſtating and operation, perfectly eaſy in every reſpect: which rule is ſo comprehenſive, that it alſo includes the queſtions of the compound rule, or rule-of-five; and not only thoſe which are commonly given in books, wherein the ſtatings are either both direct, or one direct and the other inverſe, but alſo thoſe in which the ſtatings are both indirect.

The fractions are pretty largely treated of, and particularly the abbreviating part; becauſe it is of the greateſt uſe, by ſerving to abridge the operations in all the other rules. The advantage of fractions is ſo great, that I dare affirm it, a perſon who is well acquainted with them, will in many caſes, perform as many calculations as four or five who are not. In decimals the ſeparating points are placed againſt the upper part of the figures; which prevents them from being miſtaken for ſtops or pauſes in the reading; the hint of which I had from ſome tables in Sir *Iſaac Newton's* opticks.

In compound intereſt, when the time, at which the intereſt is ſuppoſed to be payable, is ſome part of a year, I have, in the calculations, accounted the rate correſponding to that time, the ſame part of the rate for the whole year: thus at 5 *per cent. per annum*, the rate for half-yearly payments I make $2\frac{1}{2}$, and for quarterly payments, $1\frac{1}{4}$, &c. I ſay this here, to ſhow upon what ſuppoſition thoſe examples are calculated, as it is conteſted whether this method ought to be uſed, or not.

In the extraction of roots, I have given a new, general, and very expeditious method, by which the third and higher roots may be found without the intolerable labour attending the common methods.

In this edition are made many uſeful alterations and additions in ſeveral parts of the book, as will appear on the peruſal of it. There is alſo now printed a Key to this Arithmetic, in a ſeparate volume, for the uſe of teachers, containing the ſolutions, at full length, of all the queſtions propoſed in this book.

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A COMPLETE SYSTEM OF Practical Arithmetic.

PRACTICAL ARITHMETIC is the art of numbering, or of performing calculations by numbers.

NOTATION.

NOTATION is the expreſſing of any propoſed number, either by words or characters.

All numbers are expreſſible by theſe ten characters or figures, 1, 2, 3, 4, 5, 6, 7, 8, 9, 0, or cipher, and the uſual method of notation by theſe figures is ſo contrived, that any character is increaſed in its value in a tenfold proportion for every place it is removed towards the left, among the other figures with which it is connected; ſo in theſe figures 333, the firſt 3 (reckoning from the right to the left) is 3 ones, but the ſecond is 3 tens, and the third is 3 hundreds; alſo in theſe 2759, the 9 repreſents 9 ones, but the 5 repreſents five tens, the 7 is 7 hundreds, and the 2 is 2 thouſand. And although the cipher ſignify nothing by itſelf, yet when ſet on the right of any of the other figures, it increaſeth their value in the ſame tenfold proportion above deſcribed; thus, though 2 ſtanding alone, or in the firſt place, repreſents only two ones, yet when a cipher is ſet on the right of it thus, 20, it repreſents 2 tens, or twenty; and if another cipher be affixed thus, 200, it will repreſent 2 hundreds, &c.

For the more eaſy reading of large numbers, when they are expreſſed by figures, they are divided from the right hand towards the left, into periods and half periods, each half period conſiſting of three figures; the common name of the firſt period being units, or ones; of the ſecond, millions; of the third billions; of the fourth trillions, &c. Alſo the firſt half of any period is ſo many ones of it, but the latter half is ſo many thouſands of it.

The following example exhibits a ſummary of this whole doctrine:

Quintillions	Quadrillions	Trillions	Billions	Millions	Units
th. un.	th. un.	th. un.	th. un.	th. un.	c.x.t. c.x.u.
373,829.	759,761.	235,871.	296,473.	918,651.	437,256.

Note. The firſt nine characters are called ſignificant figures, to diſtinguiſh them from the cipher, which of itſelf is inſignificant. Alſo a number expreſſing a quantity of one name or denomination, is called a ſimple number, as 20 pounds, or ſeventeen gallons, or five days; and that repreſenting a quantity of ſeveral names, is called a compound number, as 13 pounds 5 ſhillings and 6 pence, or 17 gallons and 2 pints, or 3 hours and 50 minutes.

I. *Having any number propoſed in words, to expreſs the ſame in figures.*

RULE.

Write down ciphers to ſo many periods and places as are named in the given number; then, beginning at the left, obſerve at each place what ſignificant figure is named, and, taking away the cipher, write the ſignificant figure in its place.

EXAMPLES.

1. Expreſs in figures, four thouſand, one hundred and ſeventy-three.

2. Write down in figures, Twenty-three millions, two hundred and ſixty thouſand, nine hundred and thirty.

3. Write in figures, Four thouſand and twenty-five millions, one hundred and three thouſand, and ſix.

4. Expreſs in figures, Two hundred ſeventeen thouſand and fifty millions, eight thouſand, ſeven hundred, and ſixteen.

5. Write down in figures, Seventy thouſand billions, one hundred three thouſand and fifty millions, three thouſand and eight.

6. Expreſs in figures, Eight hundred trillions, one hundred ſeventy-five thouſand ſeven hundred and forty-eight billions, three hundred thouſand millions, five thouſand and ſeventy.

II. *Having any number expreſſed in figures, to read the ſame, or to expreſs it in words.*

RULE.

Divide the figures in the given number, as in the general example above, into periods and half periods, by any convenient marks; then beginning at the left, the figures are thus read, viz. the firſt figure of each half period is named by itſelf with the word *hundreds*, but the other two are named together; and at the end of the firſt half of each period, the word *thouſands* is named; but at the end of the other half, the common name of the whole period, except it be the units period, whoſe name is not expreſſed.

EXAMPLES.

1. Let it be required to expreſs in words, 17359.
2. Write down in words, 7301462.
3. Write down in words, 3920500706.
4. Expreſs in words, 1020030004000.
5. Write in words, 2073000091630702.
6. Write down in words, 5030027869400003.

A SYNOPSIS of the ROMAN NOTATION.

1 = I
2 = II: As often as any character is repeated, ſo many times
3 = III its value is repeated.
4 = IIII or IV: A leſs character before a greater diminiſhes its
5 = V value.
6 = VI. A leſs character after a greater increaſes its value.
7 = VII
8 = VIII
9 = IX
10 = X
50 = L
100 = C
500 = D or IↃ. For every Ↄ affixed, this becomes 10 times as many.
1000 = M or CIↃ: for every C and Ↄ, ſet one at each end, it becomes
2000 = MM 10 times as much.
5000 = IↃↃ: or $\overline{V}$: A line over any number, increaſes it 1000 fold.
6000 = $\overline{VI}$
10000 = $\overline{X}$ or CCIↃↃ
50000 = IↃↃↃ
60000 = $\overline{LX}$
100000 = $\overline{C}$ or CCCIↃↃↃ
1000000 = $\overline{M}$ or CCCCIↃↃↃↃ
2000000 = $\overline{MM}$
&c. &c.

SIMPLE ADDITION.

SIMPLE Addition is the finding of one ſimple number equal to ſeveral ſimple numbers taken all together.

The number which is equal to ſeveral taken together, is called their ſum.

Simple addition may be performed by this

RULE.

1. Place the ſeveral numbers, to be added, underneath each other, ſo that the figures of the ſame name, with reſpect to units, tens, &c. may be ſtraight under each other.

2. Draw a line under the loweſt number; then add up the column of units, and conſider how many tens are in the ſum, for which you muſt carry ſo many ones, to the next column, writing down only the exceſs over and above the tens, below the line ſtraight under its proper column.

3. Add all the columns in the ſame manner, and the figures below the line will expreſs the ſum required.

To prove Addition. Cut off the uppermoſt number, by drawing a line below it. Add all the reſt of the lines of numbers together, and ſet their ſum below the ſum to be proved. Then add this laſt-found number and the uppermoſt line together, and their ſum will be the ſame as that found by the firſt addition when the work is all right.

EXAMPLES.

1. What is the ſum of 37, 509, 7126, 17630 and 459273?

2. Required the ſum of 3579, 41, 96120, 725, 11, 1820, 5, and 720139.

3. What is the ſum of 2591, 720396, 14, 259, 6, 370214, 9740, 53, 1692, and 137?

4. How many days are in the twelve calendar months?

5. Suppoſe that from London to Hatfield is 20 miles, from thence to Stilton 57 miles, thence to Newark 48 miles, thence to Doncaſter 37 miles, thence to Northallerton 62 miles, thence to Durham 34 miles, and from thence to Newcaſtle 15 miles; how many miles are between London and Newcaſtle?

6. A perſon dying left to his widow 1500 pounds, to his eldeſt ſon he left [illegible]0500, and to each of his other two ſons 3406; and 2700 to each of his three daughters, beſides 751 pounds in other ſmall legacies; what did he die poſſeſſed of?

SIMPLE SUBTRACTION.

SIMPLE Subtraction is the finding how much one ſimple number exceeds another, or the taking a leſs ſimple number out of a greater.

The number to be ſubtracted is called the *ſubtrahend*; and that out of which it is to be taken, is called the *minuend:* alſo the number remaining after the one is taken out of the other, is named their *difference*.

Simple Subtraction is performed by the following

RULE.

1. Place the ſubtrahend under the minuend, units under units, &c. according to the directions given in addition, and draw a line below them.

2. Begin at the right, and ſubtract each under figure from that which ſtands above it, writing the remainder ſtraight under them below the line; ſo ſhall all the remainders together expreſs the difference required.

3. But when any under figure exceeds that which is above it, conceive 10 to be added to the upper, and ſubtract the under from the ſum, but in this caſe, you muſt add 1 to the next under figure, before you ſubtract it.

To prove Subtraction.

Add the difference and ſubtrahend together, and the ſum will be equal to the minuend when the operation is right.

EXAMPLES.

1. What is the difference between 1735 and 1897348?

2. How much does 54012 exceed 7953?

3. How much is 30491 leſs than 57321469?

4. Suppoſe that from London to Edinburgh (by way of Newcaſtle) is 393 miles, and that from London to Newcaſtle is 273 miles; how many miles are between Newcaſtle and Edinburgh?

5. How much is A older than B, A being born in the year 1701, and B in 1739?

6. How much is C, whoſe age is 71, older than D, whoſe age is 34?

SIMPLE MULTIPLICATION.

SIMPLE Multiplication is the finding of a ſimple number which ſhall contain any given ſimple number a certain propoſed number of times; and it is therefore a compendious method of addition.

The two propoſed numbers are, in general, termed the *factors* of the multiplication; but, in particular, that which is to be multiplied, is called the *multiplicand*; and that you multiply by, the *multiplier*; alſo the number found from the operation is named the *product* of the two factors.

Before proceeding to any operations in this rule, the following table of products muſt be learnt very perfectly:

MULTIPLICATION TABLE.

1	2	3	4	5	6	7	8	9	10	11	12
2	4	6	8	10	12	14	16	18	20	22	24
3	6	9	12	15	18	21	24	27	30	33	36
4	8	12	16	20	24	28	32	36	40	44	48
5	10	1	20	25	30	35	40	45	50	55	60
6	12	18	24	30	36	42	48	54	60	66	72
7	14	21	28	35	42	49	56	63	70	77	84
8	16	24	32	40	48	56	64	72	80	88	96
9	18	27	36	45	54	63	72	81	90	99	108
10	20	30	40	50	60	70	80	9	100	110	120
11	22	33	44	55	66	77	88	99	110	121	132
12	24	3	48	60	72	84	9	108	120	132	144

Simple multiplication may be performed by the two following

RULES.

I. *To multiply by a ſingle figure, or by any number in the firſt line of the foregoing table of products.*

Begin at the right hand ſide of the multiplicand, and multiply each figure in it by the multiplier, ſetting down the whole of ſuch products as are leſs than ten; but for ſuch as are juſt equal to a certain number of tens, write down 0, and carry 1 for each 10 to the next product;

and for ſuch as exceed a certain number of tens, ſet down the exceſs, and carry for the tens as before.

EXAMPLES.

Multiply 1234567890 by each number ſeparately from 2 to 12.

II. *To multiply by a number conſiſting of ſeveral figures.*

1. Write it below the multiplicand, and find the product for each figure in it as in the firſt caſe, not regarding in what order the lines are found, provided the firſt figure in each ſtand ſtraight below its reſpective multiplier.

2. Add all the lines of products together in the ſame order as they ſtand, and the ſum will be the whole product required.

To prove Multiplication. Make the former multiplicand the multiplier, and the multiplier the multiplicand, and proceed as before, and the reſult will be the ſame as before when the work is right. *Or thus:* add together the figures in each factor, caſting out all the nines in them, or as often as they amount to 9. Multiply the two remainders together, and the nines caſt out of their product will leave the ſame remainder as the nines caſt out of the anſwer when the work is right.

EXAMPLES.

1. Required the product of 273580961 and 23?
Anſ. 6292362103.

2. Required the product of 6241578309 and 37?
Anſ. 230938397433.

3. What is the product of 5318625074 and 43?
Anſ. 228700878182.

4. What is the product of 751900368 and 51?
Anſ. 38346918768.

5. What is the product of 402097316 and 195?
Anſ. 78408976620.

6. What is the product of 82164973 and 3027?
Anſ. 248713373271.

7. What is the product of 16358724 and 704006?
Anſ. 11516639848344.

8. What is the product of 921760035 and 520007091?
Anſ. 479321754400408185.

9. What is the product of 38015732 and 400700065?
Anſ. 15232906283422580.

CONTRACTIONS.

I. When there are ciphers at the right of one or both factors, proceed as before, neglecting the ciphers; and to the right of the product, place as many ciphers as are in both factors.

So to multiply 390720400 by 406000:

Having written the terms as are here annexed, and multiplied by the two ſignificant figures of the multiplier, to the ſum of the two products ſubjoin the five ciphers which are on the right hand of the two factors.

$$\begin{array}{r} 390720400 \\ 406000 \\ \hline 23443224 \\ 15628816 \\ \hline 158632482400000 \\ \hline \end{array}$$

EXAMPLES.

1\. Multiply 718603400 by 57. - - Anſ. 40960393800.

2\. Required the product of 70100 and 9001635. Anſ. 631014613500.

3\. What is the product of 9030100 and 21000? Anſ. 189632100000.

4\. What is the product of 7030 and 815036000? Anſ. 5729703080000.

So that, if any number is to be multiplied by 1 with ciphers annexed, the product will be found by only annexing the ciphers to the figures of the multiplicand.

EXAMPLES.

1\. The product of 71 and 10 is 710.

2\. The product of 2107 and 100 is

3\. The product of 5030700 and 1000 is

III. When the multiplier is the product of two or more numbers in the table, it is often of advantage to multiply continually by thoſe numbers, inſtead of it.

Thus, to multiply 160430800 by 10800.

Becauſe the component parts of 108 are 12 and 9, that is 9 times 12 produce 108; therefore multiply firſt by 12, and that product by 9; and to the laſt product affix the four ciphers which are on the right of the two factors.

$$\begin{array}{r} 160430800 \\ 12 \\ \hline 19251696 \\ 9 \\ \hline 1732652640000 \\ \hline \end{array}$$

EXAMPLES.

1\. Required the product of 51307298 and 56, or 7 times 8. Anſ. 2873208688.

2\. What is the product of 31704592 and 36? Anſ. 1141365312.

3\. What is the product of 29753804 and 72? Anſ. 2142273888.

4\. What is the product of 7128368 and 96? Anſ. 684323328.

5. What is the product of 61835720 and 1320?
Anſ. 81623150400.

IV. When ſome of the figures of the multiplier may be produced by multiplying ſome others of them by any number, it is much eaſier and more conciſe, after having obtained the product of the leſs, to multiply that product by the ſame number for the product of the greater, than to proceed by the common method.

Note. This holds as well when the leſs numbers are on the left as when they are on the right of the greater; for, by the general rule, the products of the figures of the multiplier may be taken in any order. So, in the 1ſt of the following examples, firſt multiply by the 3, and then its product by 3 again, for the product of 9, becauſe 3 times 3 are 9—In the ſecond example, 1ſt multiply by the 4, and then double its product, for the product of 8, becauſe 2 times 4 are 8. In the 3d example, 1ſt multiply by the right hand 8, then 6 times its product will be the product of 48 the next two figures, and again two times this laſt will be the product for 96, the other two figures; ſo that there are only three lines of products to add up—In the 4th example, firſt multiply by the 5 on the left-hand, then 5 times its product will be the product for the 25 on the right of it, and 3 times this laſt will be the product for the remaining 75, becauſe 3 times 25 are 75.—And in the 5th example, begin with the 3 in the middle, then 9 times its product will be the product for the 27 on the left, and again 2 times this laſt will be the product for the 54 on the right. So that none of theſe examples have more than three lines of products—But in operating this way, be careful to attend to the general rule of placing the 1ſt figure of each product ſtraight below the 1ſt figure of its own multiplier:

The operation for the 5th or laſt example is here annexed.

```
     71380164
        27354
-------------
  214140492..
 1927264428...
   3854528856
-------------
1952533006056
-------------
```

1. Multiply 35802916 by 93. - - Anſ. 3329671188.

2. Required the product of 910738060 and 48.
Anſ. 43715426880.

3. What is the product of 61370913 and 96488?
Anſ. 5921556653544.

4. What is the product of 13861470 and 52575?
Anſ. 728766785250.

5. What is the product of 71380164 and 27354?
Anſ. 1952533006056.

SIMPLE DIVISION.

SIMPLE Diviſion is the finding how often one ſimple number is contained in another; or the dividing of any given ſimple number into any propoſed number of equal parts.

The containing number, or number to be divided is called the *dividend*.

The contained number, or the number of parts into which the dividend is divided, is called the *diviſor*.

The number of times the dividend contains the diviſor, or the number which expreſſes one of the equal parts, is called the *quotient*. Thus:

Dividend
Diviſor 3) 12 (4 Quotient

Note. Diviſion is a compendious ſubtraction, the quotient being the number of ſubtractions in the operation.

Simple diviſion may be performed by the following

RULE.

1. Having written down the diviſor and dividend, as in the form above, conſider if the diviſor be leſs than, or equal to, the ſame number of the left-hand figures of the dividend; if ſo, write the figure expreſſing the number of times it is contained, in the quotient; but if not, take one place more of the dividend figures than are in the diviſor, and write the number of times they contain it in the quotient as before.

2. Multiply the diviſor by the quotient figure.

3. Subtract the product from the ſame dividend figures.

4. To the remainder affix the next dividend figure, and write in the quotient the number of times the diviſor is contained in this number; multiply the diviſor by the laſt quotient figure, and ſubtract the product from the laſt mentioned number; then proceed as before from the beginning of this article, till all the dividend figures are uſed.

Note 1. It is ſometimes troubleſome to find how often the diviſor is contained in the ſeveral dividuals; but part of the trouble will be ſaved by obſerving, that when any product exceeds its dividual; the quotient figure belonging to ſuch product muſt be leſſened till the product be equal to or leſs than its dividual; again, if, after ſubtracting the product from its dividual, the remainder be equal to, or exceed the diviſor; the quotient figure muſt be increaſed till the remainder be leſs than it.

2. To complete the quotient, ſet the laſt remainder (if any) at the end of it, above a ſmall line with the diviſor below it.

To prove Diviſion.

Multiply the quotient by the diviſor, to the product add the remainder, and the ſum will be equal to the dividend when the work is right.

EXAMPLES.

1. Divide 73146085 by 4. - - - - Anſ. 18286521$\frac{1}{4}$.
2. What is the quotient of 5317986027 divided by 7?
Anſ. 759712289$\frac{4}{7}$.
3. What is the quotient of 570196382 by 12?
Anſ. 47516365$\frac{2}{12}$.
4. How often is 37 contained in 74638105?
Anſ. 2017246$\frac{3}{37}$ times.
5. How often does 137896254 contain 97?
Anſ. 1421610$\frac{84}{97}$ times.
6. Divide 35821649 into 764 equal parts.
Anſ. They are each 46886$\frac{745}{764}$.
7. What is the quotient of 72091365 by 5201?
Anſ. 13861$\frac{1504}{5201}$.

CONTRACTIONS.

I. Diviſion by a ſingle figure, or by any figure in the firſt line of the multiplication table, may be expeditiouſly performed by multiplying and ſubtracting mentally, and writing down only the quotient below the dividend.

EXAMPLES.

3) 56103961
18701320$\frac{1}{3}$ Quot.

4) 52019675

5) 1370192

6) 38072040

7) 81390627

8) 23718620

9) 4308196

10) 7803196

11) 5701423 12) 2798313

II. When the diviſor has ciphers on the right of it, you may ſtrike them off, and divide without them; but the ſame number of figures muſt be ſtruck off from the right of the dividend, and affixed to the laſt remainder.

EXAMPLES.

2,0) 370419,6 12,00) 718306,15

Divide 3108690170 by 7100. - - Anſ. $437843\frac{4870}{7100}$.
What is the quotient of 7380964 by 23000? Anſ. $320\frac{20964}{23000}$.
What is the quotient of 2304109 by 5800; Anſ. $397\frac{1500}{5800}$.

III. Hence, to divide by 1 with any number of ciphers annexed, you need only ſtrike off from the right of the dividend ſo many figures as the diviſor contains ciphers; which figures, ſo ſtruck off, will be the remainder, and thoſe on the left the quotient.

EXAMPLES.

5138602 divided by 100 is equal to $51386\frac{2}{100}$.
2701483 by 1000 is
3702140 by 100 is

IV. When the diviſor is the product of two or more ſmall numbers, it is much eaſier to divide continually by thoſe numbers, than by the whole diviſor at once.

Note. If there be any remainders after ſuch diviſions multiply the laſt remainder by the preceding diviſor, and to the product add the remainder belonging to the ſame diviſor: then multiply the ſum by the next preceding diviſor, and to the product add its correſponding remainder: proceed in the ſame manner through all the diviſors and remainders; ſo ſhall the laſt ſum be the remainder, the ſame as if the diviſion had been performed at once.

After the operation deſcribed in this note is begun, it muſt be continued according to the deſcription, though ſome of the preceding diviſions ſhould happen to have no remainders.

So, to divide 42901685 by 96, whoſe component parts are 8 and 12; divide the firſt by 8, and this quotient by the 12, and the remainders are 5 and 6; then 6 times 8 are 48, to which add the 5, and the ſum 53 is the whole remainder to the whole diviſor 96.

$$\begin{array}{rl} 8) & 42901685 \\ 12) & 5362710\frac{5}{8} \\ \text{Quotient} & 446182\frac{53}{96} \end{array}$$

EXAMPLES.

1. Divide 31046835 by 56, or 7 times 8. Quot. 554407$\frac{43}{56}$.
2. Divide 7014596 by 72. - - Quot. 97424$\frac{68}{72}$.
3. Divide 5130652 by 132. - - Quot. 38868$\frac{76}{132}$.
4. Divide 83016572 by 240. - - Quot. 345902$\frac{92}{240}$.

V. When you are pretty ready in diviſion, you may, even in the largeſt diviſions, ſubtract each figure of the product as you produce it, and write down only the remainders.

EXAMPLES.

1. Divide 3104679 by 833.

$$\begin{array}{r} 833)\ 3104679\ (3727\frac{88}{833} \\ 6056 \\ 2257 \\ 5919 \\ 88 \end{array}$$

2. Divide 79165238 by 238. - - - Quot. 332627$\frac{12}{238}$.
3. Divide 29137062 by 5317. - - Quot. 5479$\frac{5219}{5317}$.
4. Divide 62015735 by 7803. - - Quot. 7947$\frac{5294}{7803}$.

REDUCTION.

REDUCTION is the converſion of numbers from one name to another, but ſtill retaining the ſame value.

If the reduction be to a leſs name, it is commonly called reduction *deſcending*; but if to a greater, reduction *aſcending*.

RULE.

Conſider how many of the leſs name concerned make 1 of the greater, and by that number multiply the given number if the reduction be deſcending, but divide if aſcending, and the product or quotient will be the value in the other name.

Note 1. When there are names between the propoſed and required ones, it is beſt to reduce the propoſed to the next leſs or greater name, and this to the next leſs or greater again, and ſo on, till you have reduced it to the name required.

2. When, in reduction deſcending, the propoſed is a compound number, you muſt add, or take in the ſmall numbers in the names below the greateſt, to the ſame names, as you proceed in the reduction.

3 When, in reduction aſcending, you have any remainders after dividing, they will have the ſame names as their reſpective dividends, and may be placed after the laſt quotient, according to the order of their names, the greateſt firſt; ſo ſhall the compound number thus formed be the anſwer.

OF MONEY.

Farthings	Pence		
4	1	Shillings	
48	12	1	Pound
960	240	20	1

Note 1. This and the following tables are to be underſtood thus: The words at top are the names of all the numbers ſtraight below them; and all the numbers upon the ſame line, from left to right, are of equal value: thus, in the laſt line of this table, 960 farthings, 240 pence, 20 ſhillings, and 1 pound are all equal to each other.

2. l denotes pounds, s ſhillings, and d denotes pence.

3. $\frac{1}{4}$ denotes 1 farthing, or one quarter of any thing.
$\frac{1}{2}$ - - a half-penny, or a half of any thing.
$\frac{3}{4}$ - - 3 farthings, or 3 quarters of any thing.

4. The full weight and value of our gold and ſilver coin is as here below.

Gold.	Value. l	s	d	Weight. dwt	gr
A guinea	1	1	0	5	$9\frac{1}{2}$
Half-guinea	0	10	6	2	$16\frac{1}{4}$
Quarter-guinea	0	5	3	1	$8\frac{1}{4}$

SILVER.	Value. s	d	Weight. dwt	gr
A crown	5	0	19	$8\frac{1}{2}$
Half-crown	2	6	9	$16\frac{3}{4}$
Shilling	1	0	3	21
Sixpence	0	6	1	$22\frac{1}{2}$

The value of Gold is nearly 4l an ounce, or 2d a grain; and ſilver is nearly 5s an ounce. Alſo any quantity of gold is to the ſame weight of ſtandard ſilver, in the proportion of 15 and 1-14th to 1, or nearly 15 to 1.

EXAMPLES.

1. How many ſhillings and pence are in 23l? Anſ. 460s or 5520d.

2. Reduce 5520 pence into ſhillings and pounds. Anſ. 460s or 23l.

3. Reduce 351l 13s 0$\frac{3}{4}$d to farthings. Anſ. 337587 farthings.

4. How many pounds, &c. are in 337587 farthings? Anſ. 351l 13s 0$\frac{3}{4}$d

5. In 35 guineas how many farthings? Anſ. 35280 farthings.

6. In 35280 farthings how many guineas? Anſ. 35 guineas.

7. How many crowns, ſhillings, groats, and pence, are in 50 pounds? Anſ. 200 cr. 1000s. 3000gr, 12000d.

8. Reduce 12000 pence to groats, ſhillings, crowns and pounds. Anſ. 3000 gr, 1000s, 200 cr, 50l.

OF TROY WEIGHT.

Grains	Pennyweights	Ounces	Pound
24	1		
480	20	1	
5760	240	12	1

Note. By this weight are weighed jewels, gold, ſilver, corn, bread, and liquors. One grain of Troy weight is equal to one grain and a half of ſound dry wheat.

EXAMPLES.

1. How many ounces, pennyweights, and grains, are in 37lb. - - - Anſ. 444oz, 8880 dwts, 213120 grs.

2. Reduce 213120 grains to lb. - - - Anſ. 37lb.

3. In 59 lb 13 dwt 5 gr, how many grains? Anſ. 340157 grs.

4. In 340157 grains, how many lbs &c. &c. Anſ. 59 lb 13 dwts 5 qrs.

OF

OF APOTHECARIES WEIGHT.

Grains	Scruples	Drams	Ounces	Pound
20	1			
60	3	1		
480	24	8	1	
5760	288	96	12	1

Note. This weight is ſo called, becauſe the apothecaries uſe it in compounding their medicines; but they buy and ſell their drugs by avoirdupois weight. Apothecaries is the ſame as troy weight, having only ſome different diviſions.

EXAMPLES.

1. In 17 lb how many ounces, drams, and ſcruples?
Anſ. 204 oz, 1632 dr, 4896 ſcr.
2. How many lbs are in 4896 ſcruples? - Anſ. 17lb.
3. In 231 lb 3 oz and 5 gr, how many grains?
Anſ. 1332005 grs.
4. In 1332005 grains, how many lb? Anſ. 231 lb 3 oz 5 grs.

OF AVOIRDUPOIS WEIGHT.

Drams	Ounces	Pounds	Quarters	Hundreds	Ton
16	1				
256	16	1			
7168	448	28	1		
28672	1792	112	4	1	
573440	35840	2240	80	20	1

Note. By this weight are weighed all things of a coarſe or droſſy nature; ſuch as grocery and chandlers wares, and all metals except gold and ſilver.

Note alſo, 1 lb Avoirdupois makes 14 oz 11 dwt 15½ gr Troy.
1 oz - - 0 18 5½
1 dr - - 0 1 3½

EXAMPLES.

1. In 15 tons, how many c, qrs, and lb?
Anſ. 300 c, 1200 qrs, 33600 lb.
2. Reduce 33600 lb to tons? - - Anſ. 15 tons.
3. In 9 c 5 lb how many ounces? - Anſ. 16208 oz.
4. How many cwt are in 16208 oz? - Anſ. 9 cwt 5 lb.
5. In 35 ton 17 c 1 qr 23 lb 7 oz 13 dr. how many drams? - - - Anſ. 20571005 dr.

6. Reduce 20571005 drams to tons.
Anſ. 35 t 17 c 1 qr 23 lb 7 oz 13 dr.

OF LONG MEASURE.

Inches	Feet	Yards	Poles	Furlongs	Mile
12	1				
36	3	1			
198	16½	5½	1		
7920	660	220	40	1	
63360	5280	1760	320	8	1

Note. An inch is ſuppoſed equal to 3 barley corns in length.
4 inch.—a hand.
6 feet, or 2 yards—a fathom.
3 miles—a league.
60 nautical or geographical miles—a degree, or 69½ ſtatute miles nearly.
Alſo 360 degrees, or 25000 miles nearly, is the circumference of the earth.

EXAMPLES.

1. How many inches are between London and Newcaſtle, or in 273 miles? - - - Anſ. 17297280 inch.
2. In 17297280 inches, how many miles? Anſ. 273 miles.
3. Reduce 5 mls 6 furl 3 yds into inches.
Anſ. 364428 inches,
4. In 364428 inches how many miles?
Anſ. 5 mls 6 furl 3 yds.
5. Reduce 2 mls 1 furl 8 pls 3 yds 2 inc, into inches.
Anſ. 136334 inch.
6. In 136334 inches, how many miles, &c.
Anſ. 2 mls 1 furl 8 pls 3 yds 2 inch.

OF CLOTH MEASURE.

Inches	Nails	Quarters	Yard
2¼	1		
9	4	1	
36	16	4	1

Note, 3 qrs = 1 ell Flemiſh
5 — — Engliſh
6 — — French.
4 qrs 1⅕ inch Scotch.

EXAMPLES.

1. In 37 yds, how many qrs and nails?
Anſ. 148 qrs, 592 nails.

2. How many yards are in 592 nails? Anſ. 37 yds.
3. Reduce 15 yds 3 qrs 1 nail to nails. Anſ. 253 nails.
4. How many yards are in 253 nails? Anſ. 15 yds 3 qrs 1 nl.
5. In 73 ells Flemiſh, how many qrs. Anſ. 219 qrs.
6. How many ells Flem. are in 219 qrs. Anſ. 73 ells Fl.
7. Reduce 17 ells Eng. 3 qrs to nails. Anſ. 352 nls.
8. In 352 nails, how many ells Engliſh? Anſ. 17 ells Eng. 3qr.

OF SQUARE OR LAND MEASURE.

Sqr. inch.	Sqr. ft				
144	1	Sqr. yds			
1296	9	1	Sqr. pls		
39204	272¼	30¼	1	Roods	
1568160	17890	1210	40	1	Acre
6272640	43560	4840	160	4	1

EXAMPLES.

1. In 15 acres, how many poles? Anſ. 2400 poles.
2. How many acres are in 2400 poles? Anſ. 15 acres.
3. Reduce 27 a 1 r 32 p into poles. Anſ. 4392 poles.
4. Reduce 4392 poles into acres. Anſ. 27 a 1 r 32 p.

OF WINE MEASURE.

Pints	Galls.					
8	1	Tres				
336	42	1	Hhd			
504	63	1½	1	Punch		
672	84	2	1½	1	Pipe or But	
1008	126	3	2	1½	1	Ton
2016	252	6	4	3	2	1

Note, 231 cubic inch —a gallon.
10 gall —an anker.
18 gall.—a rundlet.
31½ gall.—a barrel.

By this meaſure, wines, brandies, ſpirits, perry, cider, mead, vinegar, oil, and honey are meaſured.

EXAMPLES.

EXAMPLES.

1. In 19 hhds of wine, how many pints? Anſ. 9576 pints.
2. How many hhds are in 9576 pints of wine? Anſ. 19 hhds.
3. Reduce 13 tuns 1 pipe 1 hhd 17 gal 5 pts to pints. Anſ. 27861 pts.
4. Reduce 27861 pints to tuns. Anſ. 13 tuns 1 pipe 1 hhd 17 gal 5 pints.

OF ALE AND BEER MEASURE.

Pints	Gall				
8	1	Firk			
68	8½	1	Kilderk		
136	17	2	1	Br	
272	34	4	2	1	Hhd
408	51	6	3	1½	1

Note, The ale gallon contains 282 cubic inches.

In London, the ale firkin contains 8 gallons, and the beer firkin 9; the other measures above it being decreaſed and increaſed in the ſame proportion.

EXAMPLES.

1. In 13 hhds of ale, how many gallons? Anſ. 663 gall.
2. How many hhds are in 663 gallons of ale? Anſ. 13hds.
3. How many pints are in 1 bar 1 fir 3 pints of ale? Anſ. 343pints.
4. Reduce 343 pints of ale to barrels. Anſ. 1 bar 1 fir 3 pts.

OF DRY MEASURE.

Pints	Gal						
8	1	Pecks					
16	2	1	Buſh				
64	8	4	1	Combs			
256	32	16	4	1	Quar		
512	64	32	8	2	1	Weys	
2560	320	160	40	10	5	1	Laſt
5120	640	320	80	20	10	2	1

Note. The gallon dry meaſure contains $268\frac{4}{5}$ cubic inches, and the buſhel $2150\frac{2}{5}$ cubic inches. At London 36 buſhels of coals make a chaldron. A buſhel water meaſure is 5 pecks.

By dry meaſure, all dry wares, ſuch as corn, ſeeds, fruits, roots, ſand, ſalt, coals, oyſters, muſcles, cockles, &c. are meaſured.

EXAMPLES.

1. In 128 qrs how many pecks? - - Anſ. 4096 pecks.
2. How many qrs are in 4096 pecks? - Anſ. 128 qrs.
3. In 3 laſts 5 qrs 3 buſh. how many gallons? Anſ. 2264 gal.
4. Reduce 2264 gallons to laſts. - Anſ. 3 ls 5 qrs 3 buſh.

Of TIME.

Minutes	Hours			
60	1	Days		
1440	24	1	Weeks	
10080	168	7	1	Months
40320	672	28	4	1

Note, The minute is divided into 60 ſeconds, and the ſecond may be ſuppoſed to be divided into 60 thirds, and theſe again into 60 fourths, &c.

EXAMPLES.

1. How many minutes are in 1763 months? Anſ. 71084160 min.
2. In 71084160 minutes, how many months? Anſ. 1763 months.
3. How many ſeconds are in a ſolar year, or 365 days 5 hrs 48 min 58 ſec. Anſ. 31556938 ſec.
4. In 31556938 ſeconds, how many days, &c. Anſ. 365 ds 5 hrs 48 min 58 ſec.
5. In a lunar month, or 29 ds 12 hrs 45 min, how many ſeconds? Anſ. 2551500 ſec.
6. Reduce 2551500 ſeconds to days. Anſ. 29 ds 12 hrs 45 min.

COMPOUND ADDITION.

COMPOUND Addition is the finding the ſum of ſeveral compound numbers.

RULE.

1. Place the numbers of the ſame denomination under each other, according to the directions given in ſimple addition.

2. Add up the figures in the loweſt denomination, alſo as in ſimple addition.

3. Find how many units of the next higher denomination are contained in the ſum, by dividing it by ſo many as of this name make one of the next, or any other way.

4. Write the remainder or overplus underneath, and carry the ones or units to the figures in the next denomination; whoſe ſum you muſt find and proceed with as before; and ſo on, through all the denominations, to the higheſt, whoſe ſum muſt be all ſet down, which, together with the ſeveral remainders, will expreſs the total required.

Note, Addition of money may be performed by the general rule, or by help of the following tables.

PENCE TABLES.

d		s	d	s		d
20	——	1	8	2	——	24
30	——	2	6	3	——	36
40	——	3	4	4	——	48
50	——	4	2	5	——	60
60	——	5	0	6	——	72
70	——	5	10	7	——	84
80	——	6	8	8	——	96
90	——	7	6	9	——	108
100	——	8	4	10	——	120
110	——	9	2	11	——	132
120	——	10	0	12	——	144

EXAMPLES *of* MONEY.

l	s	d	l	s	d	l	s	d	l	s	d
7	13	3	14	7	5	15	17	10	53	14	8
3	5	10½	8	19	2¼	3	14	6	5	10	2¾
6	18	7	5	3	4½	23	6	2¾	93	11	6
0	2	5¾	21	2	9	8	3	5	7	5	0
4	0	3	7	16	8½	15	6	4	2	0	9
17	15	4½	0	4	3	6	12	9¾	0	18	7

l	s	d	l	s	d	l	s	d	l	s	d
14	0	7¼	37	15	8	61	3	2½	472	15	3
5	13	6	14	12	9¾	7	16	8	9	2	2½
62	4	7	5	6	11	29	13	10¾	27	12	6¼
4	17	8	23	10	9¼	8	14	0	370	16	2½
23	0	4¾	8	6	0	0	7	5¼	25	3	8
6	6	7	14	0	5½	24	13	0	6	10	5¾
91	0	10¼	54	2	7½	5	0	10¾	30	0	11¾

Suppoſe that A is indebted to B, 34l 13s 7d, and to C, 1730l, to D, 9l 19s 2d, to E, 134l 7d, to F, 17s 2d, and, to G, 9d What is A's whole debt? Anſ. 1909l 11s 3d.

Suppoſe that B owes A 75l 17s; C owes 15s 5d; D owes 21l 13s 6½d; E owes 9½d; F owes 796l 3d; and G owes 17l 13s 10d: what is due to A by all of them?

Anſ. 912l 0s 10d.

A owes to B, for tea, 13l 10s; for cheeſe, 17l 13s 5d; for cotton, 208l 17s; for Indian chintz, 86l 7d; for his acceptance of a bill, 300l: for factorage, 15l 17s 3¾d; alſo for inſurance and other charges, 30l 10s 4½d: how much is A's whole debt to B? Anſ. 672l 8s 8¼d.

A corn-factor pays for wheat, 37l 15s 8d; for rye, 11l 16s 3d, for oats, 96l 7½d; for barley 53l 12s; alſo for peas and beans, 10l; he has alſo paid for carriage and other petty charges, 3l 17s 5¾d; and for inſurance, 11l. 3¾d: now, ſuppoſing his commiſſion on the whole is 7l 3s 0½d, for how much muſt he draw upon his employer to clear the account? - - Anſ. 231l 5s 4½.

A nobleman, going out of town, is informed by his ſteward, that his butcher's bill comes to 197l 13s 7½d; his baker's to 59l 5s 2¾d; his brewer's to 85l; his wine-merchant's to 103l 13s; to his lordſhip's corn-chandler is due 75l 3d; to his tallow-chandler and cheeſe-monger, 27l 15s 11¼d; and to his tailor, 55l 3s 5¾d; alſo for rent, ſervants' wages, and other charges, 127l 3s: now ſuppoſing he would take 100l with him, to defray his charges on the road, for what ſum muſt he ſend to his banker?

Anſ. 830l 14s 6¼d.

EXAM-

EXAMPLES of WEIGHTS, MEASURES, &c.

TROY WEIGHT

lb	oz	dwt
17	3	15
4	6	3
0	10	7
9	5	0
176	2	17
23	11	12

oz	dwt	gr
37	9	3
9	5	3
3	16	21
17	7	8
5	9	0
3	0	19

APOTHECARIES WEIGHT.

lb	oz	dr	ſc
3	5	7	2
13	7	3	0
9	11	0	1
0	9	1	2
36	3	5	0
5	8	6	1

oz	dr	ſc	gr
3	5	1	17
7	3	2	5
16	7	0	12
9	5	1	5
4	1	2	18
36	4	1	14

AVOIRDUPOIS WEIGHT

lb	oz	dr
17	10	13
5	14	8
8	6	15
27	1	6
0	4	0
6	14	10

cwt	qr	lb
15	2	15
6	3	24
7	0	10
9	1	17
10	2	6
3	0	3

LONG MEASURE.

mls	fur	pls
29	3	14
19	6	29
5	4	20
9	1	37
7	0	3
4	5	9

yds	feet	inc
127	1	5
12	2	9
0	2	6
54	1	11
5	2	7
23	0	5

CLOTH MEASURE.

yds	qr	nls
26	3	1
13	1	2
6	2	0
217	0	3
9	1	0
55	3	1

el en	qrs	nls
270	1	0
57	4	3
8	2	1
0	3	2
10	1	0
4	4	1

LAND MEASURE.

ac	ro	p
225	3	37
10	1	25
9	0	13
4	2	9
42	1	19
7	0	6

ac	ro	p
19	0	16
270	3	29
9	1	3
23	0	34
7	2	16
75	0	23

WINE MEASURE

T	hds	gal
13	3	15
8	1	37
4	2	26
25	0	12
3	1	9
72	3	21

hhds	gal	pts
15	61	5
7	16	3
29	23	7
3	15	1
16	8	0
4	36	6

ALE and BEER MEASURE.

hds	gal	pts
17	37	3
4	13	5
3	6	2
5	14	0
12	9	6
8	42	4

hds	gal	pts
29	43	5
7	9	2
14	16	6
6	8	1
57	13	4
5	6	0

DRY MEASURE.

L	qr	bu		qr	bu	pe
13	5	2		25	7	3
7	1	3		5	3	1
41	7	4		17	5	2
3	0	7		6	2	3
24	3	0		33	0	2
5	2	1		7	4	1

TIME.

mo	we	da		hrs	m	s
17	3	4		27	15	37
26	1	6		12	26	14
7	0	2		3	7	16
19	2	3		35	42	59
8	3	0		6	9	4
12	1	6		31	16	22

A gentleman bought of a ſilver-ſmith, diſhes to the weight of 23lb 6 oz 5 dwt; plates 41 lb 7 oz 17 dwt; ſpoons 12 lb 15 dwt; ſalts 2 lb 7 oz; waiters 13 lb; and tankards 7 lb 17 dwt. What weight of plate did he buy in all.

Anſ 99 lb 10 oz 14 dwt.

An apothecary made a compoſition of 5 ingredients, the 1ſt of which weighed 13 lb 7 oz; the 2d, 11 oz 7 dr 13 gr. the 3d, 7 lb 2 ſcr; the 4th, 11 lb 3 dr 1 ſcr; and the 5th weighed 15 lb 5 oz 7 gr. What was the weight of the whole? —— Anſ. 48 lb 3 dr 1 ſcr.

A country ſhopkeeper buys of a merchant in London, teas weighing 3 qrs 14 lb; coffee 1 qr 23 lb; ſugars 3 cwt 2 qr 5 lb; ſpices 2 qr 3 lb 13 oz; hops 13 cwt 1 qr 24 lb; and ſeveral other things to the weight of 3 cwt 17 lb 7 oz. For what weight has he to pay carriage on bringing them home? —— Anſ. 22 cwt 3 lb 4 oz.

From A to B is 3 mls 2 fur 7 pls, from B to C is 17 mls 13 pls; from C to D is 7 fur; and from D to E is 5 mls 33 pls. What is the diſtance between A and E?

Anſ. 26 mls 2 fur. 13 pls.

Bought four parcels of cloth, the 1ſt of which contains 25 yds 3 qrs; the 2d, 37 yds 2 qrs 3 nls; the 3d, 14 yds 1 n; and the 4th, 23 yds. How many yards are in them all? —— Anſ. 100 yds 2 qrs.

There are five pieces of ground, the firſt of which meaſures 13 ac 3 r 14 p; the 2d, 27 ac 29 p; the 3d, 19 ac 1 r; the 4th, 3 r 34 p; and the 5th, 45 ac 2 r 11 p. What is the ſum of their meaſures? Anſ. 106 ac 3 ro 8 p.

A gentleman bought of a wine-merchant, of port wine 1 tun 3 hhds; of claret 3 hhds 47 gal; of mountain 1 hhd

5 gal; and of Liſbon, 2 hhds 23 gal. What quantity did he buy in all? - - Anſ. 3 tuns 2 hdds 12 gal.

A beer brewer has ſent into the country, ale, as follows, viz. at one time 3 hhds 14 gal; at another 2 hhds 17 gal; at another 14 hhd 27 gal; and at another 6 hhds 47 gal. How much was ſent at all the times?

Anſ. 26 hhds 3 gal.

A corn-merchant ſends over the ſea, of wheat 13 laſts 3 qr 5 buſh; of oats 29 lſts 7 qr; of rye he has ſent 3 laſts 7 buſh; of peas 8 qrs 3 buſh; and of beans 5 qr. For what has he freight to pay?

Anſ. 47 lſts 4 qr 7 buſh.

When B was born, A's age was 113 mths 2 wks; when C was born, B's age was 97 mo 1 we 5 ds; when D was born, C's age was 107 mo 3 ds 14 hs; and when E was born, D's age was 75 mo 3 we 19 hs. What was A's age when E was born?

Anſ. 393 mo 3 we 2 ds 9 hs.

COMPOUND SUBTRACTION.

COMPOUND Subtraction is the finding the difference between two numbers, of which one or both are compound.

RULE.

1. Set the leſs number under the greater, as directed in compound addition.

2. Then, beginning at the leaſt denomination, ſubtract the under number of each from the upper, writing their reſpective remainders below them.

3. But if the under number of any of the denominations be greater than the upper, add ſo many to the upper as make one of the next higher denomination; then take the under from the ſum, writing down the remainder as before, and carry or add one to the under number of the next higher denomination, before you ſubtract it.

EXAMPLES *of* MONEY.

	l	s	d	l	s	d	l	s	d	l	s	d
From	79	17	[illegible]¾	103	3	2½	57	0	10	251	13	0
Take	35	12	4¼	71	12	5¼	29	13	3¼	35	4	7¾
Rem.												
Proof												

What is the difference between 73l 5½d and 19l 13s 10d. — — Anſ. 53l 6s 7½d.

A lends to B 100l how much is B in his debt, after A has taken goods of him to the amount of 73l 12s 4¾d.

Anſ. 26l 7s 7¼d.

Suppoſe that my rent for half a year is 10l 12s; and that I have laid out for the land-tax, 14s 6d, and for ſeveral repairs, 1l 3s 3¼d, what have I to pay of my half year's rent? — — Anſ. 8l 14s 2¼d.

A trader, failing, owes to A, 35l 7s 6d; to B, 91l 13s ½d; to C, 53l 7¼d; to D, 87l 5s; and to E, 111l 3s 5¼d. When this happened, he had by him in caſh, 23l 7s 5d; in wares, 53l 11s 10¼d; in houſehold furniture, 63l 17s 7¾d; and in recoverable book debts, 25l 7s 5d. What will his creditors loſe by him ſuppoſing theſe things delivered to them?

Anſ. 212l 5s 6½d

EXAMPLES *of* WEIGHTS, MEASURES, *&c.*

	TROY WEIGHT								APOTHECARIES WEIGHT.				
	lb	oz	dwt	gr	lb	oz	dwt	gr	lb	oz	dr	ſcr	gr
From	7	3	14	11	4	9	1	13	73	4	7	0	14
Take	3	7	5	19	3	7	16	12	26	7	2	1	16
Rem.													
Proof													

AVOIRDUPOIS WEIGHT.

	c	qrs	lb	lb	oz	dr
From	5	0	17	71	5	9
Take	3	2	11	14	6	14
Rem.						
Proof						

LONG MEASURE.

	m	fu	pl	yd	ft	in
From	14	3	17	96	1	4
Take	3	7	9	41	2	7
Rem.						
Proof						

CLOTH MEASURE.

	yd	qr	nl	yd	qr	nl
From	17	2	1	9	0	2
Take	5	2	1	6	1	2
Rem.						
Proof						

LAND MEASURE.

	ac	ro	p	ac	ro	p
From	17	1	14	57	1	16
Take	9	3	6	24	2	25
Rem.						
Proof						

WINE MEASURE.

	t	hd	gal	hd	gal	pt
From	17	2	23	5	0	4
Take	4	3	39	3	2	7
Rem.						
Proof						

ALE and BEER MEASURE.

	hd	gal	pt	hd	gal	p
From	14	29	3	71	16	5
Take	7	34	5	17	3	2
Rem.						
Proof						

DRY MEASURE.

	la	qr	bu	bu	gal	pt
From	9	4	7	13	7	1
Take	3	7	2	7	3	4
Rem.						
Proof						

TIME.

	mo	we	da	ds	hrs	min
From	71	2	5	114	17	26
Take	14	3	0	75	12	33
Rem.						
Proof						

COM-

COMPOUND MULTIPLICATION.

COMPOUND Multiplication is the finding of a number which ſhall contain a given compound number any propoſed number of times.

RULE.

1. Set the multiplier under the loweſt denomination of the multiplicand.

2. Multiply the number of the loweſt denomination by the multiplier, and find how many units of the next higher denomination are contained in the product, as in compound addition.

3. Write down the exceſs, and carry the ones to the product of the next higher denomination; with which proceed as before; and in like manner with all the other denominations to the higheſt.

I. EXAMPLES *of* MONEY.

l	s	d	l	s	d	l	s	d
0	9	4¾	7	9	8¼	18	6	1½
		4			5			6
1	17	7						
2	14	6	17	3	7¼	6	12	0½
		7			8			9
0	17	2¾	5	0	10	2	6	0¼
		10			11			12

II. EXAMPLES *of* WEIGHTS, MEASURES, &c.

TROY WEIGHT.

lb	oz	dwt	gr
3	0	14	9
			3

AVOIRDUPOIS WEIGHT.

cwt	qr	lb
17	3	23
		5

LONG MEASURE.

miles	fur	poles
31	3	27
		7

CLOTH MEASURE.

yd	qr	nl
53	1	3
		9

WINE MEASURES.

tuns	hds	gal
19	3	17
		11

hd fir pts
Mult. 3 5 47 by 18.
Anſ. 71 hds 30 pints.

las qrs bus
Mult. 5 3 7 by 72.
Anſ. 387 laſ 9 qrs.

mon we da
Mult. 7 3 5 by 26.
Anſ. 206 mo 4 da.

cwt qr lb
Mult. 3 7 14 by 53.
Anſ. 178 cwt 3 qrs 14lb.

APOTHECARIES WEIGHT.

lb	oz	dr	ſc	gr
13	5	3	1	14
				4

AVOIRDUPOIS WEIGHT.

lb	oz	dr
21	11	15
		6

LONG MEASURE.

yd	feet	inc
11	1	10
		8

LAND MEASURE.

ac	ro	pol
15	2	29
		10

ALE MEASURE.

hds	gal	pin
53	33	3
		12

bar kild gal
Mult. 21 1 13 by 36.
Anſ. 787 bar 1 kil 9 gal.

buſ pec gal
Mult. 71 3 1 by 132.
Anſ. 9487 bu 2 pec.

days hrs min
Mult. 14 13 27 by 47
Anſ. 684 da 8 hr 9 m.

cwt lb
Mult. 17 12 by 75.
Anſ. 1283 cwt 4 lb.

See more of compound multiplication under Rule I. of *Rules of Practice*.

COMPOUND DIVISION.

COMPOUND Diviſion is the dividing compound numbers into any propoſed number of equal parts.

RULE.

1. Place the diviſor and dividend as in ſimple diviſion.

2. Begin at the higheſt denomination, and divide each of them by the diviſor, writing the quotients under their reſpective dividends.

3. But if there be a remainder after dividing any of the denominations except the leaſt, you may find how many of the next lower denomination it is equal to, and add it to the ſmall number (if any) which was in this denomination before; then divide the ſum.

I. EXAMPLES *of* MONEY.

	l	s	d
3)	1	8	6
5)	0	6	3
7)	0	11	11½
9)	0	12	9
11)	19	10	6

	l	s	d
4)	1	10	8
6)	0	4	9
8)	1	1	0
10)	28	18	4
12)	40	8	0

II. EXAMPLES *of* WEIGHTS, MEASURES, *&c.*

TROY WEIGHT.

lb oz dwt

4) 13 1 15 (

AVOIRDUPOIS WEIGHT.

C qr lb

7) 75 1 12 (

LONG MEASURE.

miles fur pls

11) 58 5 12 (

CLOTH MEASURE.

yds qrs nls

1[illegible]) 31 2 3 (

APOTHECARIES WEIGHT.

lb oz dr ſc gr

6) 2 5 3 0 19 (

AVOIRDUPOIS WEIGHT.

lb oz dr

9) 5 3 14 (

LONG MEASURE.

yds feet inc

12) 150 1 7 (

LAND MEASURE.

ac ro pls

26) 17 3 17 (

See more of compound diviſion under Rule II. of *Rules of Practice.*

GOLDEN-RULE, OR RULE-OF-THREE.

THE Rule-of-Three is that by which a number is found, having to a given number the ſame proportion which is between two other given numbers. For this reaſon it is ſometimes named the *Rule of Proportion.*

It is called the Rule-of-Three, becauſe in each of its queſtions there are given three numbers at leaſt. And becauſe of its excellent and extenſive uſe, it is often named the *Golden Rule.*

For the ſtating, or rightly placing down the three given numbers, obſerve the following

RULE.

1. Write down the number which is of the ſame kind with the anſwer or number required.

2. Conſider whether the anſwer ought to be greater or leſs than this number: then write reſpectively the greater or leſs of the two remaining numbers on the right of it for the third, and the other on the left for the firſt number or term.

3. Multiply the ſecond and third terms together, divide the product by the firſt, and the quotient will be the anſwer.

Note

Note 1. When you can conveniently multiply and divide as in compound multiplication and diviſion, it is beſt ſo to do.

2. But if not, reduce the compound terms to the loweſt name mentioned in them, and the firſt and third to the ſame name, if they be not ſo already; then will the anſwer be of the ſame name with the 2d term.

3. When there happens to be a remainder after diviſion, reduce it to the name next below the laſt quotient, and divide by the ſame diviſor, ſo ſhall the quotient be ſo many of the ſaid next name; do this as long as there is any remainder, till you have reduced it to the leaſt name, and all the quotients together will be the anſwer.

4. If the 1ſt term, and either the 2d or 3d, can be divided by any number, without remainder, let them be divided, and the quotients uſed inſtead of them.

5. There are 4 other methods of operation beſides the general one above delivered, any of which, when poſſible, performs the work much ſhorter than it. They are thus:

Firſt, Divide the 2d term by the 1ſt, multiply the quotient by the 3d, and the product will be the anſwer.

Second, Divide the 3d term by the 1ſt, multiply the quotient by the 2d, and the quotient will be the anſwer.

Third, Divide the 1ſt term by the 2d, divide the 3d by the quotient, and the laſt quotient will be the anſwer.

Fourth, Divide the 1ſt term by the 3d, divide the 2d by the quotient, and the laſt quotient will be the anſwer.

For an example, let it be propoſed to find the value of 14 oz 8 dwt of gold at 3l 19s 11d an ounce.

EXPLANA. Having ſtated the three terms by the general rule, as here annexed, the 2d term is reduced to pence, and the third to dwts, theſe being their loweſt denominations, as directed in the 2d note. The 1ſt term is alſo reduced to dwts, that it may agree with the 3d by the ſame note. The 2d term is then multiplied by the 3d, and the product divided by the 1ſt, according to the general rule, when the anſwer comes out 13809 pence, and 12 remaining over; which remainder being reduced to farthings, and theſe divided by the ſame diviſor 20, by the 3d note, the quotient is 2 farthings, and 8 remaining.—Laſtly, the pence are divided by 12 to reduce them to ſhillings, and theſe again by 20 for pounds; when the final ſum comes out 57l 10s 9d 2q, for the anſwer.

```
oz    l   s   d       oz dwt
 1 :  3  19  11  : :  14  8 :
20   20                20
——   ——               ———
20   79               288
     12
     ——
     959
     288
    ————
     7672
    7672
   1918
   —————
2,0)27619,2
     13809 12/20 pence, or
12)13809d 2 8/20 qr
2,0)115,0s 9d 2 8/20 q
Anſ. 57l 10s 9d 2 8/20 q.
```

But

Bût this queſtion will alſo ſerve to illuſtrate ſome more of the notes, by means of which it can be eaſier ſolved than by the general rule as above given; for having ſtated it as before, and as here again annexed, and reduced the 1ſt and 3d terms to dwts, divide them each by 4, and uſe the quotients 5 and 72 inſtead of them, as by the 4th note; then multiply and divide, as directed by the 1ſt note, by compound multiplication and diviſion, multiplying by 8 and 9 inſtead of 72, its component parts; after which the anſwer comes out the ſame as before, but with much leſs trouble.

```
 oz    l    s    d       oz  dwt
  1 :  3   19   11 : : 14   8 :
 20              8       20
 ---  ------------  ---------
4)20  31   19    4    4)288
   5             9        72
     -------------
    5)287  14    0
    Anſ. 57l 10s 9d 2 2/5 q.
```

Several of the following large collection of examples will afford occaſions to illuſtrate the different parts of the 5th note, as well as the other notes.

EXAMPLES.

1. If 8 yards of cloth coſt 24s, what will 96 yards coſt? Anſ. 14l 8s.

2. How many yards of cloth may be bought for 14l 8s, when 8 yards coſt 24s? - - - Anſ. 96 yds.

3. What will be the price of 72 yards of cambric, of which 9 yards coſt 5l 12s? - - Anſ. 44l 16s.

4. What will 9 yards of cambric coſt, at the rate of 44l 16s for 72 yards? - - - Anſ. 5l 12s.

5. If 7 cwt 1 qr of ſugar coſt 26l 10s 4d, what will be the price of 43 cwt 2 qrs? - - Anſ. 159l 2s.

6. What quantity of ſugar may be bought for 159l 2s, at the rate of 7 cwt 1 qr for 26l 10s 4d? Anſ. 43 cwt 2 qrs.

7. How many yards of muſlin may be bought for 44l 16s, whereof 9 yards coſt 5l 12s? - - Anſ. 72 yds.

8. How much muſt be paid for 26 bags of hops, at 21l 4s for 8 bags? - - - Anſ. 68l 18s.

9. How many men muſt be employed to finiſh a piece of work in 15 days, which 5 men can do in 24 days? Anſ. 8 men.

10. How many yards of broad cloth may be bought for 5l 12s, of which 72 yards coſt 44l 16s? Anſ. 9 yds.

11. What muſt be paid for 53 ells eng 1 qr of holland, at the rate of 7s 9½d per yard? Anſ. 25l 18s 1¼d.

12. How many yards of matting, which is 2 feet 6 inches broad, will cover a floor which is 27 feet long and 20 broad? - - Anſ. 216 feet or 72 yds.

13. What quantity of ſugar may be bought for 26l 10s 4d, when the price of 43 cwt 2 qr is 159l 2s?
Anſ. 7 cwt 1 qr.

14. In how many days will 8 men finiſh a piece of work, which 5 men can do in 24 days? Anſ. 15 days.

15. What muſt be paid for 8 bags of hops, when the price of 26 bags is 68l. 18s? - - - Anſ. 21l 4s.

16. A perſon failing in trade, owes in all, 977l, and has in money, goods, and recoverable debts 420l 6s $3\frac{1}{4}$d, ſuppoſing theſe things delivered to his creditors, what will they get per pound? - - - - Anſ. 8s $7\frac{1}{4}$d

17. What muſt be given for a piece of ſilver weighing 73 lb 5 oz 15 dwts at the rate of 5s 9d per ounce?
Anſ. 253l 10s $0\frac{3}{4}$d.

18. Bought 3 caſks of raiſins, each weighing 3 cwt 1 qr 7 lb neat, what will they coſt at 2l 6s 6d per cwt?
Anſ. 23l 2s $1\frac{1}{8}$d.

19. A garriſon, being beſieged, has 5 months proviſion in it, at the rate of 12 ounces a day for each man; but being informed that it cannot be relieved till after 9 months, how much per day muſt each man have that the proviſions may laſt that time? - - - Anſ. $6\frac{2}{3}$ ounces.

20. What will the tax upon 763l 15s be, at the rate of 3s 6d per pound? - - - Anſ. 133l 13s $1\frac{1}{2}$d.

21. How much ſilver may I have for 253l 10s $0\frac{3}{4}$d, at 5s 9d per ounce? - - Anſ. 73 lb 5 oz 15 dwts.

22. What will 7 cwt 1 qr of ſugar coſt, at the rate of 43 cwt 2 qr for 159l 2s? - - Anſ. 26l 10s 4d.

23. What muſt be paid for 1 cwt 3 qr 17 lb of wool, at 7s 4d, the ſtone of 14 lb? - - Anſ. 5l 11s 6d $3\frac{6}{7}$q.

24. What quantity of hops may be bought for 68l 18s of which 8 bags coſt 21l 4s? - - Anſ. 26 bags.

25. How many ells eng of holland may be bought for 25l 18s $1\frac{1}{4}$d, at 7s $9\frac{1}{2}$d per yard? Anſ. 53 ells eng 1 qr.

26. A perſon ſtopping payment, owes to ſeveral 977l, but compounds with them for 8s $7\frac{1}{4}$d per pound; what muſt he pay them in all? - - - - Anſ. 420l 6s $3\frac{1}{4}$d.

27. A borrowed of B 730l for 8 months; afterwards A would requite B's kindneſs by lending him 375l; required the time it muſt be lent? - - - Anſ. 15 mo 2 we $2\frac{4}{75}$ds.

28. What will 1 qr 1 nail of velvet coſt, at 18s 6d per yard? - - - - Anſ. 5s 9d $1\frac{3}{8}$q.

29. What muſt be given for 7 c 3 qr 14 lb of cheeſe, at 1l 14s 2d per cwt? - - Anſ. 13l 9s $0\frac{3}{4}$d.

30. What is the price of 2 c 1 qr 12lb of beef, at 2s 8d per ſtone, or 14 lb? - - - Anſ. 2l 10s 3d $1\frac{5}{7}$q.

31. A tradeſman, failing, compounds with his creditors, for 8s $7\frac{1}{4}$d per pound, and at that rate he pays them in all 420l 6s $3\frac{1}{4}$d. What was his debt? - - - Anſ. 977l.

32. Bought 73 lb 5 oz 15 dwts of ſilver for 253l 10s $0\frac{3}{4}$d What did it coſt per ounce? - - - Anſ. 5s 9d.

If the tax upon 763l 15s be 133l 13s $1\frac{1}{2}$d; at what rate is it per pound? - - - - Anſ. 3s 6d per l.

34. What muſt I pay for three-eighths of a ſhip, which is valued at 700l? - - - Anſ. 262l 10s.

35. What will the carriage of 8 c 3 qrs 7 lb coſt, at 10d per ſtone? - - - - - - Anſ. 2l 18s 9d.

36. If the carriage of 5 c 14 lb for 96 miles be 1l 12s 6d; how far may I have 3 c 1 qr carried for the ſame money?

Anſ. 151 m 3 fur $3\frac{1}{13}$pol.

37. What coſt 30 pieces of lead, each weighing 1 c 12 lb, at the rate of 16s 4d per cwt? - - Anſ. 27l 2s 6d.

38. Bought a ſilver tankard, weighing 1 lb 7 oz 14 dwts, what will it coſt me at 6s 4d per ounce?

Anſ. 6l 4s $9\frac{1}{5}$d.

39. What muſt be paid for 7 caſks of prunes, each weighing 2c 1 qr 14lb, at 2l 19s 8d per cwt?

Anſ. 49l 11s $11\frac{1}{2}$d.

40. Bought 14 pockets of hops, each weighing 1 c 1 qr 18 lb, at 4l 2s 6d per cwt, what do they come to?

Anſ. 81l 9s $4\frac{1}{2}$d.

41. What muſt be given for 75 chaldrons 7 buſhels of coals, at the rate of 1l 13s 6d per chaldron?

Anſ. 125l 19s $0\frac{1}{6}$d.

42. How much muſt be paid for 17 qrs 1 peck of corn, at 3s 10d per buſhel? - - - Anſ. 26l 2s $3\frac{1}{2}$d.

43. What coſt 43 qrs 5 buſh of corn, at 1l 8s 6d the quarter? - - - - - Anſ. 62l 3s $3\frac{3}{4}$d.

44. How much a year will 173 acres 2 ro 14 pls of land give, at the rate of 1l 7s 8d per acre?

Anſ. 240l 2s 7$\frac{1}{20}$d.

45. What will 139 pigs of lead, weighing in all 243 cwt 2 qrs come to, at 9l 18s per fother of 21 cwt?

Anſ. 114l 15s 10d 1$\frac{2}{14}$q.

46. What muſt be paid for 73 pieces of lead, each weighing 1 c 3 qr 7 lb at 10l 4s per fother of 19$\frac{1}{2}$ cwt?

Anſ. 69l 4s 2d 1$\frac{18}{78}$q.

47. If 5 yards of cloth coſt 14s 2d, what muſt be given for 9 pieces, containing each 21 yds 1 qr.

Anſ. 27l 1s 10$\frac{1}{2}$d.

48. If a gentleman's eſtate be worth 2107l 12s a year, what may he ſpend a day to ſave 500l in the year?

Anſ. 4l 8s 1$\frac{19}{365}$d.

COMPOUND PROPORTION, OR RULE-OF-FIVE.

THIS rule is called *The Rule-of-Five*, becauſe that in it there are five numbers or terms given to find a ſixth.—It is often named the *Double Rule-of-Three*, becauſe its queſtions are ſometimes performed by two operations of the rule-of-three. It is alſo called *Compound Proportion.*

Note. Of the five given numbers, three contain a ſuppoſition, and the other two a demand; one of the terms of ſuppoſition being of the ſame kind with the number required, and the other two of the ſame kind as the demanding terms.

RULE *for* STATING.

1. Write down the term of ſuppoſition which is of the ſame kind with the anſwer, for the middle term.

2. Take one of the other two terms of ſuppoſition, and of the demanding terms, both of a kind; and from the directions given in the *Rule-of-Three*, conſider which places they would poſſeſs if a ſtating were made of them and the middle term only, and place them accordingly; do the ſame with the other term of ſuppoſition and its correſpondent demanding one, writing the terms under each other which fall on the right and left of the middle term.

METHOD

METHOD *of* OPERATION.

1. *By two operations.*—Take the two upper terms and the middle term, in the ſame order as they ſtand, for the firſt ſtating of the rule-of-three; then take the fourth number reſulting from the firſt ſtating, for the middle term, and the two under terms in the general ſtating, in the ſame order as they ſtand, for the extreme terms of the ſecond ſtating; and the fourth term reſulting from it will be the anſwer.

2. *By one operation.*—Multiply together the terms of which the one is above the other, on both ſides of the middle term; then account the two products and the middle term, as they ſtand, the three terms of a rule-of-three ſtating, and the fourth term thence reſulting will be the anſwer.

Note. It is generally beſt to work by the latter method, viz. by one operation. And after the ſtating, and before commencing the operation, if one of the two firſt terms, and either the middle term or one of the two laſt terms will exactly divide by one and the ſame number, let them be divided, and the quotients uſed inſtead of them; which will much ſhorten the work. Thus, if the queſtion were to find how many men can complete a trench of 135 yards long in 8 days, it being known that 16 men can dig 54 yards in 6 days. Having ſtated the terms according to the rule, the 54 yards will ſtand above the 8 days in the firſt place, the 16 men in the middle, and the 135 above 6 in the laſt place. Then divide the 54 and 135 each by 27, and place their quotients 2 and 5 after them; alſo divide the 8 and 6, each by 2, and place their quotients 4 and 3 after them. Multiply then the quotients of the firſt two terms together, and their product is 8; and multiply the quotients of the laſt two together, and their product is 15; ſo ſhall 8, 16, and 15 be the 3 terms of a ſingle ſtating. Of theſe divide the 2d term 16 by the 1ſt or 8, and the quotient is 2, by which multiply 15 the 3d term, and the product is 30, the number of men required. The whole operation is here ſubjoined.

$$\left.\begin{matrix}\text{yards } 54,\text{ or } 2\\ \text{days } 8,\text{ or } 4\end{matrix}\right\} : \overset{\text{men}}{16} :: \left\{\begin{matrix}135\text{ yards, or } 5\\ 6\text{ days, or } 3\end{matrix}\right\} : 30\text{ men.}$$

8) 16 (2

15
2

Anſ. 30 men.

EXAMPLES.

EXAMPLES.

1. If 100l in one year gain 5l intereſt, what will be the intereſt of 750l for 7 years ? - - - - Anſ. 262l 10s.

2. If 27s be the wages of 4 men for 7 days, what will be the wages of 14 men for 10 days ? - - - Anſ. 6l 15s.

3. What principal will gain 262l 10s in 7 years, at 5l per cent. per annum ? - - - - - - - Anſ. 750l.

4. If a footman travel 130 miles in 3 days when the days are 12 hours long, in how many days of 10 hours each, may he travel 360 miles ? - - - - - Anſ. $9\frac{63}{65}$ days.

5. A wall which was to be built to the height of 27 feet, was raiſed to the height of 9 feet by 12 men in 6 days ; how many men muſt be employed to finiſh the wall in 4 days, at the ſame rate of working ? - - - - Anſ. 36 men.

6. If the price of 10 ounces of bread, when the corn is at 4s 3d per buſhel, be $3\frac{1}{2}$d, what muſt be paid for 2 lb 3 oz when the corn is 5s per buſhel ? - - - Anſ. $11\frac{2}{17}$d.

7. What is the intereſt of 340l for $2\frac{1}{2}$ years, at $4\frac{1}{2}$l per cent. per annum ? - - - - Anſ. 38l 5s.

8. If 120 buſhels of corn can ſerve 14 horſes 56 days, how many days will 94 buſhels ſerve 6 horſes ?

Anſ. $102\frac{16}{45}$ days.

9. If 7 oz 5 dwts of bread be bought at $4\frac{3}{4}$d when corn is at 4s 2d per buſhel, what weight of it may be bought for 1s 2d when the price of the buſhel is 5s 6d.

Anſ. 1 lb 4 oz $3\frac{470}{627}$dwts.

10. If the carriage of 13 cwt 1 qr for 72 miles be 2l 10s 6d, what will be the carriage of 7 cwt 3 qrs for 112 miles ? - - - - - - Anſ. 2l 5s 11d $1\frac{77}{159}$q.

11. What is the intereſt of 300l for 5 weeks, at 5l per cent. per annum ? - - - - - Anſ. 1l 8s $10\frac{8}{52}$d.

12. If 3000 lb of beef ſerve 340 ſeamen 15 days, how many lb will ſerve 120 ſeamen 25 days ?

Anſ. 1764 lb $11\frac{15}{51}$oz.

RULES *of* PRACTICE.

BY *Rules of Practice* are meant certain expeditious methods of caſting up accounts: and they conſiſt of the moſt general contractions of the rule-of-three when either the firſt or third term is 1.

Note 1. One number is ſaid to be an aliquot part of another, when the former divides the latter without a remainder.

2. When the quantity concerned is not very large, and of one denomination, it is commonly beſt to work by the firſt or ſecond of the following rules; but if very large, or of ſeveral denominations, uſe ſome other of the rules of practice.

RULE I.

To find the price of any integer number of things. When that number is not very great, multiply the price of 1 or the integer by the given number whoſe price is to be found, as in compound multiplication, and the product will be their price required.

EXAMPLES.

Queſtions.	l	s	d		l	s	d *Anſwers.*
3 lb of green tea, at	0	9	6	——	1	8	6
4 lb of bohea tea, at	0	7	8	——	1	10	8
5 lb of ſugar, at	0	1	3	——	0	6	3
6 lb of flax, at	0	0	9½	——	0	4	9
7 lb of tobacco, at	0	1	8½	——	0	11	11½
8 ſtones of beef, at	0	2	7½	——	1	1	0
9 lb of galls, at	0	1	5	——	0	12	9
10 cwt of cheeſe, at	2	17	10	——	28	18	4
11 cwt of cheeſe, at	1	15	6	——	19	10	6
12 cwt of ſugar, at	3	7	4	——	40	8	0

If the multiplier exceed 12, it is commonly beſt to multiply ſucceſſively by its component parts, as in ſimple multiplication.

EXAMPLES.

Queſtions.	l	s	d		l	s	d *Anſwers.*
14 moidores, at -	1	7	0	—	18	18	0
15 piſtoles, at - -	0	17	6	—	13	2	6
16 cwt of cheeſe, at	1	18	8	—	30	18	8

18 cwt

Questions.					*Answers.*		
	l	s	d		l	s	d
18 cwt of tobacco, at	5	11	4	—	100	4	0
20 cwt of hops, at	4	7	2	—	87	3	4
21 cwt hemp, at	1	12	0	—	33	12	0
22 tons of hay, at	1	2	0	—	24	4	0
25 yds of broad cloth, at	0	9	2	—	11	9	2
28 yds ſuperf. broad cloth at	0	19	4	—	27	1	4
32 yds German ſerge, at	0	3	7	—	5	14	8
35 yds Iriſh cloth, at	0	2	5½	—	4	6	0½
40 ells of Holland, at	0	5	6	—	11	0	0
44 ells of dowlas, at	0	1	4	—	2	18	8
48 ac of arable ground, at	2	3	0	—	103	4	0
50 ac paſture ground, at	1	4	6	—	61	5	0
55 tuns of wine, at	83	10	0	—	4592	10	0
60 gallons of wine, at	0	5	8	—	17	0	0
64 gallons of brandy, at	0	9	6	—	30	8	0
70 barrels of ale, at	1	4	0	—	84	0	0
77 firkins of beer, at	0	11	7	—	44	11	11
81 firkins of ſoap, at	1	8	9	—	116	8	9
88 qrs of oats, at -	0	11	6	—	50	12	0
96 qrs of rye, at - -	1	3	4	—	112	0	0
100 ſtones of wool, at	0	7	3	—	36	5	0
120 doz of candles, at	0	5	9	—	34	10	0
132 days wages, at	0	2	4	—	15	8	0
24 tons of hay, at -	3	7	6	—	81	0	0
27 yds fine broad cloth, at	0	15	7	—	21	0	9
30 yds of ſhalloon, at	0	2	2½	—	3	6	3
33 yds of flannel, at	0	1	3	—	2	1	3
36 yds of Scotch cloth, at	0	2	9	—	4	19	0
42 ells of Holland, at	0	6	9½	—	14	5	3
45 ells of dowlas, at	0	1	6	—	3	7	6
49 acr meadow, at	1	7	10	—	68	3	10
54 acr land, at - -	1	13	0	—	89	2	0
56 pipes of wine, at	37	7	6	—	2093	0	0
63 gall of oil, at	0	2	3	—	7	1	9
66 gall of rum, at	0	8	10	—	29	3	0
72 hds at - - -	1	14	4	—	123	12	0
80 firkins of butter, at	1	5	6	—	102	0	0
84 qrs of wheat, at	1	12	8	—	137	4	0
90 qrs of barley, at	0	17	10	—	80	5	0

99 buſhels

Questions.	l	s	d		l	s	d
	l	s	d		l	s	d
99 buſhels of malt, at	0	6	3½	——	31	2	10½
110 ſheep, at - - -	0	12	8	——	69	13	4
121 weeks wages, at	9	7	6	——	45	7	6
144 reams of paper, at	0	13	4	——	96	0	0

Note. The following examples require the continual product of three numbers.

Questions.	s	d			l	s	d
112 lb or 1 cwt at	3	4½	per lb	——	18	18	0
224 lb or 2 cwt at	7	3¼	per lb	——	81	8	8
336 at ——	1	5	each	——	23	16	0
1 cwt at ——	1	9	per lb	——	9	16	0
336 lb or 3 cwt at	5	2¼	per lb	——	87	17	0
350 at — —	3	2¼	each	——	55	15	7½

But if the multiplier cannot be exactly produced by the multiplication of ſmall numbers, find the neareſt to it, either greater or leſs, which can be ſo produced; then after having multiplied continually by the component parts of this number, to or from the laſt product, add or ſubtract the produce of ſo many as it is leſs or greater than the given number.

EXAMPLES.

Questions.		l	s	d		l	s	d
17	at	0	5	6	——	4	13	6
23	at	0	1	6½	——	1	15	5½
29	at	2	5	3¼	——	65	12	10¼
34	at	0	19	7	——	33	5	10
38	at	1	11	5½	——	59	15	5
41	at	0	3	1	——	6	6	5
46	at	0	4	7¼	——	10	11	9½
51	at	0	6	7¾	——	16	18	11¼
68	at	0	9	11¼	——	33	15	9
79	at	0	11	5¾	——	45	6	10¼
94	at	0	12	2	——	57	3	8
106	at	0	14	7¼	——	77	8	0½
59	at	0	7	10	——	23	2	2

Queſtions.						*Anſwers.*		
		l	s	d		l	s	d
117	at	1	2	3	———	130	3	3
19	at	0	13	2	———	12	10	2
26	at	0	3	0¾	———	3	19	7½
31	at	0	17	5½	———	27	1	2½
37	at	0	12	10¼	———	23	15	7¼
39	at	0	7	3¾	———	14	5	2¼
43	at	0	2	10	———	6	1	10
47	at	0	5	2½	———	12	4	9½
53	at	3	15	2	———	199	3	10
62	at	0	8	5	———	26	1	10
74	at	0	10	0½	———	37	3	1
86	at	0	0	7	———	2	10	2
104	at	0	13	5½	———	69	19	8
114	at	0	15	3¾	———	87	5	7½
127	at	3	0	2	———	382	1	2

When the number is very large, as many hundreds or thouſands; multiply the price of 1 continually by 10 till it come to the higheſt denomination, namely twice by 10 for hundreds, thrice by 10 for thouſands, &c.; then multiply theſe ſeveral products by their reſpective local digits in the given number; which laſt products place orderly under each other, and add them together for the anſwer.

Ex. To find the price of 7985 at 7s 10¾d.

	l	s	d		
	0	7	10¾	× 5	
			10		
	3	18	10½	× 8	
			10		
	39	9	7	× 9	
			10		
	394	15	10	× 7	
			7		
	2763	10	10	- - - -	7000
	355	6	3	- - - -	900
	31	11	8	- - - - -	80
	1	19	5¾	- - - -	5
Anſ.	3152	8	2¾	- - - -	7985

RULE

RULE II.

When there is given the price of ſome certain number, to find the price of the integer, or 1. Divide the given price by its number, as in compound diviſion, and the quotient will be the price of 1 as required.

EXAMPLES.

Queſtions.			l	s	d			*Anſwers.* l	s	d
If	3 lb	coſt	2	14	6,	what is 1?	——	0	18	2
If	4	coſt	7	8	2,	what is 1?	——			
If	5	coſt	2	17	10,	what is 1?	——			
If	6	coſt	17	3	0,	what is 1?	——			
If	7	coſt	2	13	4½,	what is 1?	——			
If	8	coſt	57	1	2,	what is 1?	——			
If	9	coſt	19	3	6¼,	what is 1?	——			
If	10	coſt	121	5	8,	what is 1?	——			
If	11	coſt	6	14	2¾,	what is 1?	——			
If	12	coſt	27	18	7,	what is 1?	——			

When the number or diviſor exceeds 12, it is beſt to divide ſucceſſively by its component parts, as in ſimple diviſion.

Queſtions.	*Anſwers.* l	s	d
If 16 cwt coſt 30l 18s 8d, what is 1? —	1	18	8
If 22 cwt coſt 24l 4s, what is 1? ——	1	2	0
Divide 5l 14s 8d by 32. — ——	0	3	7
Divide 2l 18s 8d into 44 equal parts. ——	0	1	4
Divide 4592l 10s equally among 55 perſons.	83	10	0
If 70 be 84l what is 1? —— —	1	4	0
If 88 coſt 50l 12s what will 1 be? ——	0	11	6
Divide 34l 10s by 120. — ——	0	5	9
If 18 cwt coſt 100l 4s, what is 1? ——	5	11	4
If 27 cwt coſt 21l 9d, what is 1? ——	0	15	7
Divide 4l 19s by 36. — — —	0	2	9
Divide 68l 3s 10d into 49 equal parts. —	1	7	10
Divide 7l 1s 9d equally among 63 perſons.	0	2	3
If 80 be 102l what is 1? —— ——	1	5	6
If 99 coſt 31l 2s 10½d, what will 1 be?	0	6	3½
Divide 45l 7s 6d by 121. ——	0	7	6

Note. The following examples require three diviſions.

	l	s	d
At 18l 18s per cwt, how much per lb? —	0	3	$4\frac{1}{2}$
Divide 81l 8s 8d by 224. —— ——	0	7	$3\frac{1}{4}$
At 9l 16s per cwt. how much per lb? —	0	1	9
Divide 55l 15s $7\frac{1}{2}$d by 350. — —	0	3	$2\frac{1}{4}$

But if the diviſor cannot be produced by the multiplication of ſmall numbers, you muſt divide by it after the manner of long diviſion.

EXAMPLES.

	l	s	d	l	s	d		l	s	d	l	s	d
17)	4	13	6	(0	5	6	19)	12	10	2	(0	13	2
29)	65	12	$10\frac{1}{4}$	(2	5	$3\frac{1}{4}$	37)	23	15	$7\frac{1}{4}$	(0	12	$10\frac{1}{4}$
41)	6	6	5	(0	3	1	53)	199	3	10	(3	15	2
86)	2	10	2	(0	0	7	127)	382	1	2	(3	0	2

RULE III.

If the given price of 1 or the integer be an aliquot part of a penny, ſhilling, or pound, take the ſame part of the given quantity whoſe price is to be found (by dividing it by the number of times which the given price of 1 is contained in a penny, ſhilling, or pound) for the anſwer in pence, ſhillings, or pounds, reſpectively.

A Table of the Aliquot Parts of Money.

s	d		l
10	0	is	$\frac{1}{2}$
6	8	is	$\frac{1}{3}$
5	0	is	$\frac{1}{4}$
4	0	is	$\frac{1}{5}$
3	4	is	$\frac{1}{6}$
2	6	is	$\frac{1}{8}$
2	0	is	$\frac{1}{10}$
1	8	is	$\frac{1}{12}$
1	4	is	$\frac{1}{15}$

s	d		l		s
1	3	is	$\frac{1}{16}$		
1	0	is	$\frac{1}{20}$		
	10	is	$\frac{1}{24}$		
	8	is	$\frac{1}{30}$		
	$7\frac{1}{2}$	is	$\frac{1}{32}$		
	6	is	$\frac{1}{40}$	or	$\frac{1}{2}$
	5	is	$\frac{1}{48}$		
	4	is	$\frac{1}{60}$	or	$\frac{1}{3}$
	$3\frac{3}{4}$	is	$\frac{1}{64}$		

d		l		s
3	is	$\frac{1}{80}$	or	$\frac{1}{4}$
$2\frac{1}{2}$	is	$\frac{1}{96}$		
2	is	$\frac{1}{120}$	or	$\frac{1}{6}$
$1\frac{1}{2}$	is	$\frac{1}{160}$	or	$\frac{1}{8}$
$1\frac{1}{4}$	is	$\frac{1}{192}$		
1	is	$\frac{1}{240}$	or	$\frac{1}{12}$
$\frac{3}{4}$	is	$\frac{1}{320}$	or	$\frac{1}{16}$
$\frac{1}{2}$	is	$\frac{1}{480}$	or	$\frac{1}{24}$
$\frac{1}{4}$	is	$\frac{1}{960}$	or	$\frac{1}{48}$

EXAMPLES.

Queſtions.					*Anſwers.*		
		s	d		l	s	d
2103	at	10	0	——	1051	10	0
715	at	6	8	——	238	6	8
1496	at	5	0	——	374	0	0
420	at	4	0	——	84	0	0
831	at	3	4	——	138	10	0
275	at	2	6	——	34	7	6
937	at	2	0	——	93	14	0
3890	at	1	8	——	324	3	4
624	at	1	4	——	41	12	0
159	at	1	3	——	9	18	9
472	at	1	0	——	23	12	0
521	at	0	10	——	21	14	2
376	at	0	8	——	12	10	8
916	at	0	7½	——	28	12	6
1270	at	0	6	——	31	15	0
835	at	0	5	——	17	7	11
609	at	0	4	——	10	3	0
581	at	0	3¾	——	9	1	6¾
716	at	0	3	——	8	19	0
1953	at	0	2½	——	20	6	10½
807	at	0	2	——	6	14	6
2305	at	0	1½	——	14	8	1½
3019	at	0	1¼	——	15	14	5¾
4718	at	0	1	——	19	13	2
1927	at	0	0¾	——	6	0	5¼
741	at	0	0½	——	1	10	10½
5804	at	0	0¼	——	6	0	11

RULE IV.

If the given price be no aliquot part of a penny, ſhilling, or pound: divide it into ſeveral aliquot parts, then work for each by rule 3, and their ſum will be the anſwer.

Or, It may often be divided ſo, that the leſs will be aliquot parts of the greater; then take the ſame parts of the prices found for the greater.

EXAMPLES.

Queſtions.					*Anſwers.*		
		s	d		l	s	d
2173	at	0	1¾	——	15	16	10¾
796	at	0	2¼	——	7	9	3

Questions.				*Answers.*		
		s	d	l	s	d
1953	at	0	2¾	22	7	6¾
3406	at	0	3¼	46	2	5½
596	at	0	3½	8	13	10
802	at	0	4¼	14	4	0½
1234	at	0	4½	23	2	9
370	at	0	4¾	7	6	5½
951	at	0	5¼	20	16	0¾
603	at	0	5½	13	16	4½
239	at	0	5¾	5	14	6¼
1980	at	0	6¼	51	11	3
271	at	0	6½	7	6	9½
714	at	0	6¾	20	1	7½
591	at	0	7	17	4	9
275	at	0	7¼	8	6	1¾
596	at	0	7¾	19	4	11
1490	at	0	8¼	51	4	4½
621	at	0	8½	21	19	10½
4681	at	0	8¾	170	13	2¾
753	at	0	9	28	4	9
421	at	0	9¼	16	4	6¼
210	at	0	9½	8	6	3
765	at	0	9¾	31	1	6¾
461	at	0	10¼	19	13	9¼
273	at	0	10½	11	18	10½
536	at	0	10¾	24	0	2
910	at	0	11	41	14	2
5391	at	0	11¼	252	14	0¾
372	at	0	11½	17	16	6
420	at	0	11¾	20	11	3
2163	at	1	7	171	4	9
364	at	2	5	43	19	8
531	at	3	9	99	11	3
467	at	4	3	99	4	9
205	at	5	11	60	12	11
1734	at	6	10½	596	1	3
769	at	7	9	297	19	9
134	at	8	3¼	55	8	3½
410	at	9	7¾	197	14	9½
416	at	10	5½	217	10	8
305	at	11	9¼	179	10	1¼

1209

Queſtions.		s	d	*Anſwers.* l	s	d
1209	at	12	7	760	13	3
714	at	13	6	481	19	0
197	at	14	3½	140	15	5½
251	at	15	7	195	11	5
612	at	16	4¾	501	14	3
247	at	17	9	219	4	3
816	at	18	2¼	742	1	0
970	at	19	8	953	16	8

RULE V.

If there be pounds in the price: multiply the given quantity by the number of them. *And if there be alſo ſome odd money:* find the produce by its former rules; and add them together,

EXAMPLES.

Queſtions.		l	s	d	*Anſwers.* l	s	d
213	at	5	0	0	1065	0	0
708	at	17	0	0	12036	0	0
1150	at	2	7	6	2731	5	0
623	at	3	9	0	2149	7	0
407	at	1	13	5	680	0	7
4613	at	1	5	7	5900	15	11
941	at	7	0	4	6602	13	8
318	at	4	6	10	1380	13	0
532	at	2	15	6	1476	6	0

RULE VI.

When there is ſome odd weight or meaſure in the quantity: after having multiplied the price by the number of integers (if there be any) divide the odd quantity into aliquot parts of the integer, or of each other; and take the ſame parts of the price of the integer, or of the price of each other, and add them all together.

A TABLE *of the aliquot parts of a* cwt.

lb		cwt	lb		cwt
56	is	$\frac{1}{2}$	4	is	$\frac{1}{28}$
28	is	$\frac{1}{4}$	$3\frac{1}{2}$	is	$\frac{1}{32}$
16	is	$\frac{1}{7}$	2	is	$\frac{1}{56}$
14	is	$\frac{1}{8}$	$1\frac{3}{4}$	is	$\frac{1}{64}$
8	is	$\frac{1}{14}$	1	is	$\frac{1}{112}$
7	is	$\frac{1}{16}$			

Note, Aliquot parts of moſt other things are eaſily found.

EXAMPLES.

Queſtions.						*Anſwers.*		
		l	s	d		l	s	d
17 cwt 3 qr	—	at 1	7	0	per cwt	23	19	3
1 cwt 1 qr 8 lb		at 1	17	0	—	2	8	10½
2 cwt 2 qr	—	at 3	14	3	—	9	5	7½
2 qr 2 lb	—	at 0	19	7½	—	0	10	1¾
3 cwt 22¾ lb	—	at 0	13	5¾	—	2	3	2
2 qr 18¼ lb	—	at 0	15	2¼	—	0	10	0½
3 qr 12½ lb	—	at 2	16	10	—	2	8	11½
7 cwt 2 qr 15½ lb		at 3	0	7	—	23	2	9
3 ton 5 c 2 qr		at 7	9	3	per ton	24	8	9½
17 lb 5 oz 14 dwts		at 3	6	9	per lb	58	6	5¼
15 lb 2 oz 5 dwts		at 4	7	0	—	66	1	3¾
7 oz 15 dwt 12 gr		at 0	6	3	per oz	2	8	7
5 oz 6 dwt 17 gr		at 0	5	10	—	1	11	1¼
3 yds 1 qr	—	at 0	17	6	per yd	2	16	10½
4 yds 2 qrs 3 nls		at 1	2	4	—	5	4	8¾
1 qr 2 nls	—	at 1	12	6	—	0	12	2¼
32 ac 1 ro 14 pls		at 1	16	0	per acr	58	4	1¾
14 ac 3 ro 5 pl		at 2	12	10	—	39	0	11¼
3 gal 5 pts	—	at 0	7	6	per gal	1	7	2¼
12 gal 3 pts	—	at 0	5	8	—	3	10	1½

RULE VII.

If the price be any even number of ſhillings: multiply the quantity by half the number, doubling the firſt figure of the product for ſhillings; the reſt are pounds.

EXAMPLES.

Queſtions.				*Anſwers.*	
		s		l	s
173	at	2	—	17	6
259	at	4	—	51	16
703	at	6	—	210	18
5013	at	8	—	2005	4
872	at	10	—	436	0
460	at	12	—	276	0
627	at	14	—	438	18
598	at	16	—	478	8
214	at	18	—	192	12

RULE VIII.

When the price is any odd number of ſhillings; work for the greateſt even number contained in it, by the laſt rule; and for the other ſhilling, take $\frac{1}{20}$th of the given quantity, as in rule 1. Or, multiply by the number of ſhillings, and divide the product by 20 to reduce it to pounds.

EXAMPLES.

Queſtions.			*Anſwers.*	
		s	l	s
732	at	3	109	16
147	at	7	51	9
371	at	9	166	19
586	at	11	322	6
240	at	13	156	0
652	at	15	489	0
897	at	17	762	9
1046	at	19	993	14

RULE IX.

If there be a fraction in the given quantity: after having worked for the integral part by any of the former rules, find the produce of the fraction, by multiplying the price by the numerator, and dividing the product by the denominator; then add them together for the anſwer.

EXAMPLES.

Queſtions.					*Anſwers.*		
		l	s	d	l	s	d
$273\frac{1}{4}$	at	0	2	6	34	3	$1\frac{1}{2}$
$751\frac{1}{2}$	at	2	17	10	2173	1	9
$530\frac{3}{4}$	at	0	14	0	371	10	6
$178\frac{3}{8}$	at	0	17	0	151	12	$4\frac{1}{2}$
$231\frac{5}{8}$	at	0	7	$9\frac{1}{2}$	90	4	$8\frac{3}{4}$
$762\frac{3}{5}$	at	1	12	6	1239	4	6
$817\frac{3}{10}$	at	3	7	4	2751	11	$6\frac{1}{4}$

BILLS OF PARCELS, BOOK-DEBTS, &c.

MR. James Elford,
Bought of William Woollendraper.

Newcaſtle, 2d of March, 1783.			s	d	
15	yds of	Fine Broad Cloth, at	13	6	per yd
25	- -	Superfine ditto ——	18	9	——
27	- -	Yard-wide ditto —	8	4	——
16	- -	Drugget — —	6	3	——
12	- -	Serge — —	2	10	——
32	- -	Shalloon — —	1	8	——
			£ 53	4	10

Mr. Nicholas Norton, Bought of Henry Hoſier.

London, 24th of March, 1783.			s	d	
9	pair of	Worſted Stockings at	4	6	per pair
6	- -	Silk ditto — —	15	9	——
17	- -	Thread — —	5	4	——
23	- -	Cotton — —	4	10	——
14	- -	Yarn — —	2	4	——
18	- -	Women's Silk Gloves	4	2	——
19	yds of	Flannel — —	1	7½	per yard
			£ 23	15	4½

Mr. Matthew Milton,
Bought of Leonard Linendraper, and Co.

Durham, 9th of April, 1783.			s	d	
40	ells of	Dowlas — at	1	6	per ell
34	- -	Diaper — —	1	4½	——
31	- -	Holland — —	5	8	——
29	yds of	Iriſh Cloth — —	2	4	per yd
17½	- -	Muſlin — —	7	2½	——
13¾	- -	Cambric — —	10	6	——
27	- -	Printed Linen —	2	5	——
			£ 34	5	10¼

The honourable Lady Strawberry,

To Miles Mercer, Dr.

York, 1783					s	d	
April	12th,	9½	yds of Silk	at	12	9	per yd
	27th,	13	-- Flowered do.		15	6	- -
June	18th,	11¾	-- Luſtring	—	6	10	- -
	—	14	-- Brocade	—	11	3	- -
July	22d,	12¼	-- Satin	—	10	8	- -
	30th,	11⅜	-- Velvet	—	18	0	- -
							£44 15 10

Samuel Simpſon, Eſq.

To George Grocer, Dr.

London, 1783.					s	d	
July	18th,	15½	lb Currants	- at	0	4	per lb
	—	17¼	— Malaga Raiſins	-	0	5½	- -
	—	19¾	— Raiſins of the Sun		0	6	- -
Aug.	10th,	17	— Rice	- - -	0	3½	- -
	13th,	8¼	— Pepper	- -	1	6	- -
Sept.	14th,	3	Sugar, wt. 32½ lb		0	8½	- -
	21ſt,	13	oz of Cloves	- -	0	9	per oz.
							£3 13 0½

Ben. Bibant, Eſq.

Bought of William Winecooper.

6th of May, 1783.			s	d	
Palm Sack - -	12	gallons, at	8	6	per gal
Port, Red - -	17	- - -	5	8	- -
Claret - - - -	9	- - -	8	9	- -
Liſbon White -	34	- - -	4	10	- -
Rheniſh - -	22½	- - -	6	4	- -
Sherry - - -	27¾	- - -	6	2	- -
					£37 15 0½

Mrs. March, To Mary Milliner, Dr.

1783, Briſtol.					s	d	
May	3d,	Silver Ribbon,	21	yds at	2	2	per yd
	7th,	Fine Lace,	11½	-	10	6	- -
	—	Sarcenet Hoods	8	-	4	3	- -
June	10th,	India Fans, -	17	-	3	10	- -
	12th,	Kid Gloves, -	9 pair		2	2	p. pair
July	6th,	Lamb ditto, -	5 doz		1	2	- -
	7th,	Bobbin, -	12 pcs		0	6	p. pce

£18 0 11

Mr. Roger Retail, Bought of Thomas Teapot and Co.

June 3d, 1783.			s	d	
24½ lb	of	Royal Green Tea, at	18	6	per lb.
21¼ -	-	Imperial Tea, - -	24	0	- -
35¾ -	-	Beſt Bohea, - - -	13	10	- -
17⅔ -	-	Coffee - - -	5	4	- -
25 -	-	Double-refined Sugar,	1	1½	- -
9		Sugar Loaves, wt 137 lb -	0	7½	- -

£83 5 9

Capt. James Dixon, Bought of Chriſtopher Cornchandler.

15th of July, 1783.			l	s	d	
Wheat,	7 qrs 3 buſh	at	1	8	0	per qr
Rye,	9 - 7 -	-	1	1	6	- -
Oats,	17 - 4 -	-	0	10	8	- -
Peas,	12 buſh -	-	0	2	9	per buſh
Beans,	9 - -	-	0	3	5	- -
Malt,	17 - -	-	0	4	8	- -
Hops,	25 lb - -		0	1	4	per lb

£39 1 10¾

Mr. Conrade Compound Bought of Daniel Druggiſt.

London, 17th of Aug. 1783.

					s	d		
Cochineal,	-	21¾	lb	at	29	6	per	lb
Opium,	-	5¼	-	-	6	4	-	-
Scammony,	-	53⅛	-	-	8	10	-	-
Contrayerva,		14¾	-	-	17	0	-	-
Galls,	-	93	-	-	0	10	-	-
Gum Arabic,		71⅛	-	-	1	2⅓	-	-
Saſſafras,		112	-	-	0	4⅔	-	-

£80 1 0½

Sir Jeffery Slingſtone, Bought of Samuel Silverſmith.

Sept. 8th, 1783.	oz	dwt	gr		s	d		
A punch bowl, wt	23	4	0	at	5	10	per	oz.
A Tankard, - -	10	3	6	-	6	2	-	-
A Tea-pot and Lamp,	30	5	12	-	7	3	-	-
6 Plates - -	73	11	5	-	6	1	-	-
18 Spoons - -	41	0	10	-	6	3	-	-

£56 1 4

Mr. George Davis, Bought of Champion Cheeſemonger.

Sept. 6, 1783.	cwt	qr	lb		l	s	d	
13 Cheſhire Cheeſes, wt	5	3	12	at	1	12	6	per cwt
15 Glouceſter ditto -	3	0	18	-	1	8	0	- -
47 Stilton ditto - -	1	2	5	-	2	4	8	- -
17 lb of cream ditto, -	-	-	-		0	0	7½	per lb
9 Flitches of Bacon, wt	53ſt	3 lb			0	4	8	- ſt
15½ Firkins of Butter -	-	-			1	8	0	each

£52 0 9½

TARE *and* TRET.

GROSS weight of any commodity is its own weight together with that of its package, whether it be caſk, cheſt, or any thing elſe.

Tare is the weight of the package, or an allowance made inſtead of it.—What remains after the tare is taken from the groſs, may be called tare ſuttle, if there be more deductions.

Tret is an allowance of 4 lb upon every 104 lb of tare-ſuttle, on account of duſt or other waſte.—What remains after tret is deducted, may be called tret-ſuttle, if there be any following deduction.

Cloff is an allowance of 2 lb for every 3 cwt, and ſome ſay for every 100 lb of tret-ſuttle, to make the weight hold good when ſold by retail.

When all the deductions are made, the laſt remainder is called neat or net weight,

Note. When the tare is at ſo much per cwt, it will be beſt to divide it into aliquot parts of it, like as in the rule of practice.

2. The tret being 4 to 104, or 1 to 26, will be found by taking the 26th part of the tare-ſuttle.

3. In calculating oil and ſpirits, $7\frac{1}{2}$ lb neat are allowed to the gallon.

EXAMPLES.

1. Groſs 17 cwt 3 qr 14 lb, tare 12 lb per cwt, tret 4 to 104, and cloff 2 to 100, or 1 to 50. How much neat?

		cwt	qr	lb	
		17	3	14	groſs
lb					
8 =	$\frac{1}{14}$	1	1	3	
4 =		0	2	$15\frac{1}{2}$	
		1	3	$18\frac{1}{2}$	tare
	26	15	3	$23\frac{1}{2}$	tare ſuttle
		0	2	$12\frac{3}{4}$	tret.
	50	15	1	$10\frac{3}{4}$	tret-ſuttle.
		0	1	$6\frac{1}{4}$	cloff.
		15	0	$4\frac{1}{2}$	Net

2. What is the neat produce of 30 barrels of anchovies, weighing each 36 lb groſs, allowing 8 lb per cent tare?

Anſ. $993\frac{3}{5}$ lb.

3. Groſs 12 cwt 14 lb, tare 1 cwt 2 qr 18 lb, how much neat? - - - Anſ. 10 cwt 1 qr 24 lb

4. Suppoſe 3 cwt 1 qr 5 lb tare were allowed on 71 cwt 3 qr of tobacco, what would the neat weight be?

Anſ. 68 cwt 1 qr 23 lb.

5. In five cheſts of ſugar, weighing 112 cwt 1 qr groſs, how much neat, allowing 121 lb tare?

Anſ. 111 cwt 19 lb

6. In 25 bags of hops, containing 73 cwt 3 qr groſs, tare 10 lb per bag; how much neat?

Anſ. 71 cwt 1 qr 20 lb

7. What is the neat weight of 20 barrels of figs, each 3 cwt 1 qr 5 lb groſs, tare 14 lb per barrel?

Anſ. 63 cwt 1 qr 16 lb.

8. In 15 hhds of tobacco, each 2 cwt 1 qr 12 lb groſs, tare 1 qr 4 lb per hhd, how much neat?

Anſ. 31 cwt 8 lb.

9. What is the neat weight of 3 barrels of indigo, each 3 cwt 2 qr groſs, tare $10\frac{1}{2}$ lb per cwt?

Anſ. 9 cwt 2 qr $1\frac{3}{4}$ lb.

10. What is the neat weight of 4 hhds of ſugar, weighing as under,

	c	qr	lb
groſs	3	2	14
	5	1	7
	2	3	18
	1	3	26

, tare of the whole 1 cwt 3 qr 5 lb.

Anſ. 12 cwt 4 lb.

11. Five caſks of raiſins, wt. viz.

	cwt	qr	lb		lb
1.	3	2	12	tare	18
2.	2	3	9	-	16
3.	4	1	17	-	23
4.	5	0	8	-	27
5.	1	3	20	-	14

how much neat?

Anſ. 16 cwt 3 qr 24 lb.

12. What is the neat weight of the three following lots of wormſeed? viz.

	cwt	qr	lb	
N 1.	3	2	8	— tare 12 lb each.
2.	2	3	20	
3.	3	1	15	

Anſ. 9 cwt 2 qr 13 lb.

13. In 15 cwt 3 qr 14 lb groſs, tare 13 lb per cwt, and tret 4 lb per 104 lb, how much neat?

Anſ. 13 cwt 1 qr 27½ lb.

14. Suppoſe 17½ lb per cwt tare, and 4 lb per 104 lb. tret, were allowed on 7 caſks of prunes, each 3 cwt 1 qr 5 lb groſs; what would the neat weight be?

Anſ. 18 cwt 2 qr 24 lb.

15. What is the neat weight of 3 hdds of ſugar, weighing as follows: the firſt, 4 cwt 5 lb groſs, tare 73 lb; the ſecond, 3 cwt 2 qr groſs, tare 56 lb; and the third, 2 cwt 3 qr 17 lb groſs, tare 47 lb allowing alſo 4 lb per 104 lb tret - - - - Anſ. 8 cwt 2 qr 4 lb.

16. In 4 caſks of currants, each 7 cwt 1 qr 12 lb groſs, tare 2 qr 10 lb per caſk, tret 4 lb per 104 lb, and cloff 2 lb per 100 lb; how much neat?

Anſ. 25 cwt 2 qr 1¼ lb.

17. In 23 cwt 3 qr 7 lb groſs, how much neat, allowing 1 qr 3 lb per cwt tare, 4 lb per 104 lb tret, and 2 lb per 300 lb cloff? - - - Anſ. 16 cwt 1 qr 22¾ lb.

18. In 17 cwt 17 lb groſs weight of galls, how much neat, allowing 18 lb per cent tare, 4 lb per 104 lb tret, and 2 lb per 3 cwt cloff? Anſ. 13 cwt 3 qr 1½ lb.

19. In three caſks of oil weighing as follows: N° 1. 3 cwt 17 lb, N° 2. 2 cwt 3 qr 5 lb, N° 3. 4 cwt 1 qr 17 lb. how many gallons, allowing 18 lb per cwt tare, and 7½ lb neat to a gallon? - - - Anſ. 129 $\frac{14}{15}$ gal.

20. In 7 caſks of oil, each weighing 3 cwt 1 qr groſs, how many neat gallons, allowing 20 lb per cwt tare, and 7½ lb. per gallon? - - - - Anſ. 279 $\frac{1}{15}$ lb.

VULGAR FRACTIONS.

A FRACTION, or broken number, is an expreſſion of one or more parts of any number.

The number of parts into which the number is ſuppoſed to be divided, is called the *denominator*; and the number of thoſe parts expreſſed by the fraction, is called the ***numerator***. Alſo theſe two numbers are in general named the ***terms*** of the fraction.

If the number of which the fraction is part, or parts, be 1, it is called a *ſimple* fraction; and is denoted by the numerator written above the denominator with a ſmall line between them: So, $\frac{1}{4}$ denotes one-fourth of 1; $\frac{3}{5}$ denotes three-fifths of 1.

But if the number be different from 1, the fraction is called a compound one, and is denoted by the word *of*, and the number ſubjoined to the numerator and denominator expreſſed as before. So, $\frac{1}{4}$ of 6, denotes one-fourth of 6; $\frac{3}{5}$ of 8, denotes three-fifths of 8; and $\frac{2}{3}$ of $\frac{3}{4}$, denotes two-thirds of three-fourths of 1.

Simple fractions whoſe numerators are leſs than their denominators, are called ***proper*** fractions.—And thoſe whoſe numerators are equal to or greater than their denominators, are called ***improper*** fractions.

The expreſſion formed from an integer and a fraction joined together, is called a ***mixt number***.

Note 1. A fraction having a fraction or mixed number for its numerator or denominator, or both, is by ſome called a complex fraction.

2. A whole or integer number may be expreſſed like a fraction by writing 1 under it for a denominator: So 3 may be denoted by $\frac{3}{1}$, and 12 by $\frac{12}{1}$.

3. A fraction denotes diviſion, and its value is equal to the quotient obtained by dividing the numerator by the denominator: thus $\frac{12}{4}$ is equal to 3, and $\frac{20}{5}$ equal to 4.

4. Therefore, if the numerator be leſs than the denominator, the value of the fraction is leſs than 1. If the numerator be the ſame as the denominator, the fraction is juſt equal to 1. And if the numerator be greater than the denominator, the fraction is greater than 1

5.

$=$	denotes	equality	and is named	is equal to	thus	$8 + 2 = 10$
$+$		addition		*plus*, or more		$8 - 2 = 6$
$-$		ſubtraction		*minus*, or leſs		$8 \times 2 = 16$
$+$		multiplication		into		$8 \div 2 = 4$
$\div$		diviſion		by		

Beſides theſe. ∽ is written between two numbers, to denote their difference when it does not appear whether of them is the greater; as $\frac{13}{47} \backsim \frac{91}{103}$.

Note 6. If both the numerator and denominator of a fraction be multiplied or divided by the ſame number, the fraction will ſtill retain its original value.

Let $\frac{3}{5}$ and $\frac{8}{12}$ be two fractions propoſed: then $\frac{3}{5} \times \frac{2}{2} = \frac{6}{10}$; and $\frac{8}{12} \div \frac{4}{4} = \frac{2}{3}$. That is, if the numerator 3, and denominator 5, of the firſt fraction, be each multiplied by the ſame number 2, the produced fraction $\frac{6}{10}$, is equal to the propoſed one $\frac{3}{5}$. For the numerator and denominator of the produced fraction, are in the ſame proportion as the numerator and denominator of the propoſed one. Alſo, if the numerator 8, and the denominator 12, of the ſecond fraction, be each divided by the ſame number 4, the fractions $\frac{2}{3}$ and $\frac{8}{12}$, are equal for the ſame reaſon.

By this uſeful note, ſeveral fractions of different denominators may be readily reduced to a common denominator. Thus, $\frac{1}{3}$ may be reduced to the ſame denominator as $\frac{2}{9}$, by multiplying its terms by 3, by which it becomes $\frac{3}{9}$. Alſo $\frac{1}{2}$, $\frac{1}{4}$, and $\frac{5}{60}$, may be reduced to a common denominator, by multiplying the terms of the firſt fraction by 6, of the ſecond by 3, and dividing thoſe of the laſt by 5.

REDUCTION OF VULGAR FRACTIONS.

I. *To abbreviate or reduce fractions to leſs terms.*

RULE I.

Divide the terms of the given fraction by any number which will divide them without a remainder, ſo ſhall the quotients be the terms of a new fraction, equal in value to the former; and this you may abbreviate again, and the next again, and ſo on, till it appear that there is no number greater than 1 that will divide them, in which caſe the fraction is ſaid to be in its *leaſt* terms.

EXAMPLES.

Let $\frac{42}{72}$ be propoſed to be abbreviated.

$\frac{42}{72}=\frac{21}{36}=\frac{7}{12}$, by dividing firſt by 2 and then by 3.

Reduce $\frac{56}{72}$ to its leaſt terms.

Reduce $\frac{124}{96}$ to its leaſt terms.

Reduce $\frac{232}{464}$ to its leaſt terms.

Note I. Any number ending with an even number, or a cipher, may be divided by 2.

EXAMPLES.

$\frac{16}{24}=\frac{8}{12}=\frac{4}{6}=\frac{2}{3}$.

$\frac{32}{56}=$

$\frac{120}{240}=$

Note 2. Any number ending with 5, or 0, is diviſible by 5.

EXAMPLES.

$\frac{35}{40}=\frac{7}{8}$.

$\frac{75}{100}=$

Note 3. Any number is diviſible by 3 if the ſum of its digits be ſo: Thus 417 is diviſible by 3; becauſe 12, which is the ſum of 4 1, and 7, is ſo.

EXAMPLES.

$$\frac{45}{120}=\frac{15}{40}=\frac{3}{8}$$

$$\frac{126}{411}=$$

$$\frac{534}{672}=$$

Note. 4 If there be any ciphers at the end of each, cut off as many as are common to both.

EXAMPLES.

$$\frac{200}{340}=\frac{20}{34}=\frac{10}{17}$$

$$\frac{1200}{18000}=$$

Note 5. When any number which is expreſſed by ſeveral others with the ſign of addition or ſubtraction between them, is to be divided by any number; then all the parts of it muſt be divided by this number.

$$\text{Thus }\frac{4+6-8}{2}=2+3-4=5-4=1\ .$$

Note 6. But if the given number be expreſſed by others with the ſign of multiplication between them, only one of them muſt be divided: So

$$\frac{7\times3\times8\times10}{7\times2\times6}=\frac{3\times4\times10}{1\times6}=\frac{1\times4\times10}{1\times2}=\frac{1\times2\times10}{1\times1}=\frac{20}{1}=20.$$

And in this caſe, when the ſame number is in both the numerator and denominator, it may be left out of them.

N. B. But inſtead of writing down the whole fraction a new after every diviſion in the abreviation, as is here done in this laſt example in five different values one after another in the whole length of the line, the ſhorteſt method, and which is conſtantly practiſed by thoſe who beſt know the value and uſe of this part of the abbreviation, is thus; whatever numbers are abbreviated, or which cancel one another, draw a ſmall line through them with the pen, and place the quotients of the numbers above them or below them, according as they are in the numerator or denominator. So the foregoing fraction being here again written down, daſh or draw a ſmall line through the two ſevens, becauſe they cancel each other, as being equal; then daſh the 3 and the 6, and write the quotient 2 below the 6; next daſh the 8 and a 2, writing the quotient 4 above the 8; laſtly, daſh the 4 and the other 2, writing their quotient 2 above the 4; there being then no more figures to divide by, multiply together the numbers 2 and 10, which are not daſhed, and the product 20 is the value of the fraction required—

$$\frac{\cancel{7}\times\cancel{3}\times\overset{\overset{2}{\cancel{4}}}{\cancel{8}}\times 10}{\cancel{7}\times 2\times\underset{\cancel{2}}{\cancel{6}}}=20$$

And in this manner let the pupil be exerciſed in many examples in this rule till he is perfect in it, becauſe it is of the greateſt uſe of any by abbreviating all arithmetical operations wherever multiplications and diviſions are con cerned. Where this method is deviated from, in any of the following pages of this book, it is not to be underſtood as done through choice, but only to avoid the trouble and difficulty of procuring the types to expreſs theſe operations properly in print.

EXAMPLES.

$$\frac{2 \times 7 \times 9}{3 \times 2 \times 14} =$$

$$\frac{5 \times 2 \times 6}{3 \times 5 \times 2} =$$

$$\frac{7 \times 18 \times 40 \times 9}{10 \times 9 \times 7 \times 6} =$$

RULE II.

If the fraction muſt be brought to its leaſt terms at one diviſion, divide its terms by their greateſt common meaſure, which common meaſure is found by dividing the greater term by the leſs, and this diviſor by the remainder; and ſo on, always dividing the laſt diviſor by the laſt remainder, till 0 remain; then is the laſt diviſor the greateſt common meaſure ſought.

EXAMPLES.

Reduce $\frac{246}{372}$ to its leaſt terms at one diviſion.

First, 246)372(1
126)246(1
120)126(1
The common meaſure 6)120(20

Then $\frac{246 \div 6}{372 \div 6} = \frac{41}{62}$

Reduce $\frac{748}{916}$ to its leaſt terms.
Reduce $\frac{514}{216}$ to its leaſt terms.
Reduce $\frac{5710}{5718}$ to its leaſt terms.

II. *To reduce an improper fraction to its equivalent whole or mixt number.*

RULE.

Divide the numerator by the denominator, and the quotient will be the integer or mixed number required.

EXAMPLES.

$\frac{12}{3} = 4.$
$\frac{14}{9} =$

$\frac{15}{7} = 2\frac{1}{7}$
$\frac{257}{12} =$

III. *To reduce an integer to an equivalent fraction of a given denominator.*

RULE.

RULE.

Multiply the integer by the given denominator, and the product will be the numerator required.

EXAMPLES.

Reduce 7 to a fraction whoſe denominator ſhall be 4.

$$7 = \frac{7 \times 4}{4} = \frac{28}{4}.$$

Reduce 5 to a fraction whoſe denominator ſhall be 9.
Reduce 13 to a fraction whoſe denominator ſhall be 12.

IV. *To reduce a mixt number to an equivalent improper fraction.*

RULE.

Multiply the integer by the denominator of the fraction; to the product add the numerator; then the ſum written above the denominator will form the fraction required.

EXAMPLES.

Reduce $2\frac{3}{7}$ to a fraction.

$$2\tfrac{3}{7} = \frac{2 \times 7 + 3}{7} = \frac{14 + 3}{7} = \frac{17}{7}.$$

Reduce $12\frac{7}{9}$ to a fraction.
Reduce $14\frac{7}{10}$ to a fraction.

V. *To reduce a compound fraction to an equivalent ſimple one.*

RULE.

Multiply all the numerators together for the numerator, and all the denominators together for the denominator of the ſimple fraction required.

Note. If part of the compound fraction be an integer or a mixt number, reduce it to a fraction by one of the former caſes.

EXAMPLES.

Reduce $\frac{1}{2}$ of $\frac{2}{3}$ of $\frac{3}{4}$ of 5 to a ſimple fraction.

$\frac{1}{2}$ of $\frac{2}{3}$ of $\frac{3}{4}$ of $\frac{5}{1} = \frac{1 \times 2 \times 3 \times 5}{2 \times 3 \times 4 \times 1}$ = (by omitting the common terms 1, 2, and 3) $\frac{5}{4}$.

Reduce $\frac{2}{5}$ of $\frac{5}{8}$ of $3\frac{1}{2}$ to a ſimple fraction.
Reduce $\frac{2}{7}$ of $\frac{5}{8}$ of $\frac{7}{2}$ of 4 to a ſimple fraction.

VI. *To reduce fractions of different denominators to equivalent fractions of a common one.*

RULE I.

If the fractions can be conveniently reduced to a common denominator, by multiplying or dividing their terms, according to note 6, page 59, proceed by that method.—But, if not, multiply each numerator continually into all the denominators, except its own, for each new numerator: and multiply all the denominators together for the common denominator.

Note. It is evident, that in this and ſeveral other operations, when any of the propoſed quantities are integers, mixt numbers, or compound fractions, they muſt be reduced by their proper rules, to the form of ſimple fractions.

EXAMPLES.

Reduce $\frac{1}{2}$, $\frac{2}{3}$, and $\frac{3}{4}$ to a common denominator.

$$\text{Thus } \frac{1}{2},\ \frac{2}{3} \text{ and } \frac{3}{4} = \frac{12}{24},\ \frac{16}{24}, \text{ and } \frac{18}{24}$$

$$\text{or} = \frac{6}{12},\ \frac{8}{12}, \text{ and } \frac{9}{12}.$$

Reduce $\frac{2}{7}$ and $\frac{5}{9}$ to a common denominator.
Reduce $\frac{7}{3}$, $\frac{3}{5}$, and $5\frac{1}{6}$ to fractions of a com. denom.
Reduce $\frac{5}{6}$, $2\frac{3}{5}$, and 4 to fractions of a com. denom.

RULE II.

If the denominators of two given fractions have a common meaſure, conceive them to be divided by their greateſt common meaſure; then multiply the terms of each given fraction by the quotient ariſing from the other's denominator.

EXAMPLES.

Reduce $\frac{7}{9}$ and $\frac{4}{15}$ to a common denominator.

$$\text{Here } \frac{7}{9} \text{ and } \frac{4}{15} = \frac{7\times5}{9\times5} \text{ and } \frac{4\times3}{15\times3} = \frac{35}{45} \text{ and } \frac{12}{45}.$$

Note. In this laſt example, and thoſe of the two following rules, the forms $\left(\frac{7\times5}{9\times5} \text{ and } \frac{4\times3}{15\times3}\right)$ are printed only to ſhew which numbers or quotients are uſed in multiplying the terms of the fractions; but I think it quite needleſs for the pupil to write down his examples in this way; and I would adviſe him barely to write down ſuch an example as the above thus, $\frac{7}{9}$ and $\frac{4}{15} = \frac{35}{45}$ and $\frac{12}{45}$; and ſo of others.

Reduce $\frac{2}{15}$ and $\frac{3}{20}$ to a common denominator.
Reduce $\frac{5}{14}$ and $\frac{4}{21}$ to a common denominator.

RULE III.

If the leſs denominator of two fractions divide the greater, multiply the terms of that which hath the leſs denominator by the quotient.

EXAMPLES.

Reduce $\frac{2}{3}$ and $\frac{5}{12}$ to a common denominator.

Here $\frac{2}{3}$ and $\frac{5}{12} = \frac{2\times4}{3\times4}$ and $\frac{5}{12} = \frac{8}{12}$ and $\frac{5}{12}$

Reduce $\frac{2}{5}$ and $\frac{3}{20}$ to a common denominator.
Reduce $\frac{4}{9}$ and $\frac{5}{27}$ to a common denominator.

RULE IV.

When more than two fractions are propoſed, it is ſometimes convenient firſt to reduce two of them to a common denominator, and then theſe and a third, and ſo on till they be all reduced to their leaſt common denominator.

EXAMPLES.

Reduce $\frac{1}{12}$, $\frac{7}{8}$, and $\frac{5}{24}$ to their leaſt common denom.

By rule 3 we ſhall have $\frac{1}{12}$, $\frac{7}{8}$, and $\frac{5}{24} =$

$\frac{1\times2}{12\times2}$, $\frac{7\times3}{8\times3}$, and $\frac{5}{24} = \frac{2}{24}$, $\frac{21}{24}$, and $\frac{5}{24}$.

Reduce $\frac{3}{5}$, $\frac{4}{15}$, and $\frac{9}{20}$ to the leaſt common denom.

By rule 3, we have $\frac{3}{5}$, $\frac{4}{15}$, and $\frac{9}{20} = \frac{3\times4}{5\times4}$, $\frac{4}{15}$, and $\frac{9}{20}$

$=$ (by rule 2) $\frac{3\times4\times3}{5\times4\times3}$, $\frac{4\times4}{15\times4}$, and $\frac{9\times3}{20\times3} = \frac{36}{60}$, $\frac{16}{60}$, and $\frac{27}{60}$.

Reduce $\frac{5}{7}$, $\frac{5}{14}$, and $\frac{9}{28}$ to a common denominator.
Reduce $\frac{2}{3}$, $\frac{5}{6}$, and $\frac{7}{12}$ to a common denominator.
Reduce $\frac{7}{3}$, $\frac{3}{5}$, and $5\frac{1}{6}$ to a common denominator.

VII. *To find the value of proper fractions in numbers of inferior denominations.*

RULE.

Multiply the numerator by the integer, and divide by the denominator.

EXAMPLES.

1. What is the $\frac{4}{5}$ of 2l 6s?	2. Required the value of $\frac{2}{3}$ of 1l
2l 6s	2
4	20
5)9 4	3) 40 (13s 4d Anſ.
Anſ. 1l 16s 9d $2\frac{2}{5}$q.	1
	12
	12 (4d

3. Required the value of $\frac{3}{8}$l. - - - Anſ. 7s 6d.
4. What is the value of $\frac{4}{13}$l? - - Anſ. 6s 1d $3\frac{5}{13}$q.
5. What is the value of $\frac{2}{9}$ of a guinea? - Anſ. 4s 8d.
6. What is the value of $\frac{7}{9}$ of a ſhilling? - Anſ. 9d $1\frac{1}{3}$q.
7. What is the value of $\frac{2}{15}$ of 9s $10\frac{1}{2}$d. Anſ. 1s 3d $3\frac{1}{5}$q.
8. What is the value of $\frac{3}{4}$ of a lb troy? - - Anſ. 9 oz.
9. What is the value of $\frac{3}{4}$ of a lb avoirdupois? Anſ. 12 oz.
10. What is the value of $\frac{5}{16}$ of a cwt. - Anſ. 1 qr 7 lb
11. What is the value of $\frac{2}{7}$ of 3 cwt 1 qr 14lb
Anſ. 3 qr 24 lb.
12. What is the value of $\frac{3}{17}$ of a mile?
Anſ. 1 furlong 16 pls 2 yds 1 f. $9\frac{3}{17}$ in.
13. What is the value of $\frac{6}{7}$ of a yard? Anſ. 3 qr $1\frac{5}{7}$ nl.
14. What is the value of $\frac{5}{19}$ of an acre?
Anſ. 1 rood $2\frac{2}{19}$ pls.
15. What is the value of $\frac{7}{8}$ of a ton of wine?
Anſ. 3 hhd 31 gal 2 qrts.
16. What is the value of $\frac{2}{15}$ of a hhd of ale?
Anſ. 6 gal. $3\frac{1}{5}$ qr.
17. What is the value of $\frac{5}{9}$ of a quarter of corn?
Anſ. 4 buſh 1 pec 1 gal. $2\frac{2}{9}$ qr.
18. What is the value of $\frac{3}{10}$ of a day? Anſ. 7 hrs 12 min.
19. What is the value of $\frac{5}{7}$ of a month? Anſ. 2 we 6 ds.
20. What is the value of $\frac{7}{20}$ of an ell Engliſh?
Anſ. 1 q. 3 nls.

VIII. *To reduce fractions to other equivalent ones of a different integer*; a certain number of the leſs integer being contained in one of the greater.

RULE.

Conſider how many of the leſs integer make one of the greater; and by that number multiply the numerator if the reduction be to a leſs integer, or the denominator, if to a greater.

EXAMPLES.

Reduce $\frac{2}{9}$l to the fraction of a ſhilling.

$$\frac{2}{9}\,\text{l} = \frac{2 \times 20}{9}\,\text{s} = \frac{40}{9}\,\text{s}.$$

Reduce $\frac{40}{9}$s to the fraction of a l.

$$\frac{40}{9}\,\text{s} = \frac{40}{9 \times 20}\,\text{l} = \frac{2}{9}\,\text{l}.$$

Reduce $\frac{2}{15}$l. to the fraction of a penny.
Reduce 32d or $\frac{32}{1}$d to the fraction of a l.
Reduce $\frac{5}{2}$ to the fraction of a farthing.
Reduce $\frac{1600}{7}$ of a farthing to the fraction of a l.
Reduce $\frac{2}{7}$ cwt to the fraction of a lb.
Reduce 32 lb or $\frac{32}{1}$ lb to the fraction of a cwt.

Note. If a compound whole number be propoſed, reduce it all to the loweſt denomination mentioned in it, and proceed as before.

EXAMPLES.

Reduce 7s 3d to the fraction of a l. - - Anſ. $\frac{29}{80}$l.
Reduce $2\frac{3}{4}$d to the fraction of a ſhilling. - Anſ. $\frac{11}{48}$s.
Reduce 3 qr 14 lb to the fraction of a cwt. Anſ. $\frac{7}{8}$ cwt.

IX. *To reduce fractions to equivalent ones of a different integer*; when a certain number of the leſs is not exactly contained in the greater.

RULE.

1. By the laſt, reduce the given fraction to an equivalent one of ſuch an integer, of which a certain number are contained in the integer to which the fraction muſt be brought, or which ſhall contain a certain number of this.

2. By the laſt alſo, reduce this fraction to an equivalent one of the integer required.

EXAMPLES.

Reduce $\frac{2}{7}$ of a l to the fraction of a guinea.

$$\frac{2}{7}\text{l} = \frac{2 \times 20}{7}\text{s} = \frac{2 \times 20}{7 \times 21}\text{gui} = \frac{40}{147}\text{guinea.}$$

Reduce $\frac{5}{8}$ of a crown to the fraction of a guinea. Anſ. $\frac{25}{168}$.
Reduce $\frac{40}{147}$ of a guinea to the fraction of a l. Anſ. $\frac{2}{7}$l.
Reduce $\frac{5}{6}$ of a half-crown to the fraction of a ſhilling.
Anſ. $\frac{25}{12}$ or $2\frac{1}{12}$s.
Reduce $2\frac{1}{12}$s to the fraction of a half-crown.
Anſ. $\frac{5}{6}$ of a half crown.

ADDITION OF VULGAR FRACTIONS.

RULE.

REDUCE compound fractions to ſimple ones, and all to the ſame integer and denominator, if they be different; then add all the numerators together, and ſet the ſum over the common denominator, for the ſum of the fractions required.

Note. When ſeveral fractions are to be collected, it is commonly beſt firſt to add thoſe two together which moſt eaſily reduce to a common denominator, then their ſum and a third, and ſo on.

EXAMPLES.

1. What is the ſum of $\frac{5}{8}$, $7\frac{1}{2}$ and $\frac{1}{3}$ of $\frac{3}{4}$?

$\frac{5}{8} + 7\frac{1}{2} + \frac{1}{3}$ of $\frac{3}{4} = \frac{5}{8} \times 7\frac{1}{2} + \frac{1}{4} = \frac{5}{8} + 7\frac{4}{8} + \frac{2}{8} = 7\frac{11}{8} = 8\frac{3}{8}$ the ſum.

2. What is the ſum of $\frac{3}{5}$ and $\frac{4}{5}$? - - Anſ. $1\frac{2}{5}$.
3. What is the ſum of $\frac{2}{7}$ and $\frac{5}{14}$? - - Anſ. $\frac{9}{14}$.
4. What is the ſum of $\frac{2}{3}$, $\frac{3}{5}$, and $\frac{5}{7}$? - - Anſ. $1\frac{103}{105}$.
5. What is the ſum of $\frac{5}{9}$, $\frac{3}{5}$, and $2\frac{1}{6}$? - - Anſ. $3\frac{29}{90}$.
6. What is the ſum of $\frac{3}{5}$, $\frac{4}{5}$ of $\frac{1}{3}$, and $9\frac{3}{20}$? Anſ. $10\frac{1}{60}$.
7. What is the ſum of $\frac{2}{3}$ of a pound, and $\frac{5}{9}$ of a ſhilling?
Anſ. $\frac{125}{9}$s, or 13s 10d $2\frac{2}{3}$q.

8. What is the ſum of $\frac{3}{5}$s and $\frac{4}{15}$d.

Anſ. $\frac{112}{15}$d, or 7d $1\frac{13}{15}$q.

9. What is the ſum of $\frac{1}{7}$l, $\frac{2}{9}$s and $\frac{5}{12}$d.

Anſ. $\frac{3139}{1008}$s or 3s 1d $1\frac{10}{21}$q.

10. Suppoſe that I have $\frac{3}{8}$ of a ſhip worth 1500l, and that I buy another perſon's ſhare of her, which is $\frac{5}{16}$; what part of her belongs to me then, and what is it worth?

Anſ. I have $\frac{11}{16}$, and it is worth 1031l 5s.

SUBTRACTION OF VULGAR FRACTIONS.

RULE.

THE ſame preparations being made here as in addition, take the difference of the numerators and ſet it over the common denominator, for the difference of the fraction required.

Note. In ſubtracting mixt numbers, when the fraction in the ſubtrahend is greater than that in the minuend, ſubtract the numerator of the ſubtrahend from the denominator, and to the difference add the numerator of the minuend; and carry one to the integer in the ſubtrahend.

EXAMPLES.

1. What is the difference between $\frac{5}{6}$ and $\frac{1}{6}$?

$$\frac{5}{6} - \frac{1}{6} = \frac{5-1}{6} = \frac{4}{6} = \frac{2}{3} \text{ Anſ.}$$

2. What is the difference between $\frac{15}{22}$ and $\frac{11}{17}$?

$$\frac{15}{22} \backsim \frac{11}{17} = \frac{255-242}{17 \times 22} = \frac{13}{374} \text{ Anſ.}$$

3. What is the difference between $\frac{5}{12}$ and $\frac{7}{12}$? Anſ. $\frac{1}{6}$.

4. What is the diff. between $\frac{3}{13}$ and $\frac{4}{39}$? - Anſ. $\frac{5}{39}$.

5. What is the diff. between $\frac{5}{12}$ and $\frac{7}{13}$? - Anſ. $\frac{19}{156}$.

6. What is the diff. between $5\frac{3}{8}$ and $\frac{2}{7}$ of $4\frac{1}{6}$? Anſ. $4\frac{31}{168}$.

7. What is the diff. between $\frac{5}{9}$ of a l and $\frac{2}{3}$ of $\frac{3}{4}$ of a ſhilling? - - - - Anſ. $\frac{191}{18}$s or 10s 7d $1\frac{1}{3}$ q.

8. What is the diff. between $\frac{2}{7}$ of $5\frac{1}{6}$l and $\frac{3}{5}$ of a ſhilling?

Anſ. $\frac{3037}{2400}$l or 1l 3s 11 $\frac{3}{35}$d.

9. Suppoſe that I have $\frac{5}{8}$ of a ſhip which is worth 900l. and that I ſell $\frac{2}{3}$ of my ſhare; what part of her have I left, and what is it worth? - - Anſ. $\frac{5}{24}$; and worth 187l. 10s

MULTIPLICATION OF VULGAR FRACTIONS.

RULE.

REDUCE mixt numbers, if there be any, to fractions; then multiply all the numerators together for the numerator, and multiply all the denominators together for the denominator of the product required.

Note. A fraction is beſt multiplied by an integer, by dividing the denominator by it if poſſible; but if that cannot be done, multiply the numerator by it.

EXAMPLES.

1. What is the product of $\frac{2}{3}$, $3\frac{1}{4}$, 5, and $\frac{3}{4}$ of $\frac{3}{5}$?

$$\frac{2}{3}\times3\tfrac{1}{4}\times5\times\frac{3}{4}\text{of}\frac{3}{5}=\frac{\cancel{2}\times13\times\cancel{5}\times\cancel{3}\times3}{\cancel{3}\times\underset{2}{\cancel{4}}\times4\times\cancel{5}}=\frac{39}{8}=4\tfrac{7}{8}.\text{ Anſ.}$$

2. What is the product of $\frac{2}{7}$ and $\frac{5}{8}$? - - Anſ. $\frac{5}{28}$.
3. What is the product of $\frac{4}{15}$ and $\frac{5}{24}$? - Anſ. $\frac{1}{18}$.
4. What is the product of $\frac{3}{7}$, $\frac{4}{9}$, and $\frac{14}{15}$? - Anſ. $\frac{8}{45}$.
5. What is the product of $\frac{1}{2}$, $\frac{2}{3}$, and 3? - - Anſ. 1.
6. What is the product of $\frac{3}{14}$ and 7? - Anſ. $1\frac{1}{2}$.
7. What is the product of $\frac{7}{9}$, $\frac{3}{5}$ and $4\frac{5}{14}$? - Anſ. $2\frac{1}{30}$.
8. What is the product of $\frac{5}{6}$, and $\frac{2}{3}$ of $\frac{6}{7}$? - Anſ, $\frac{10}{21}$.
9. What is the product of $5\frac{1}{3}$, and 9? - Anſ. 48.
10. What is the product of 6, and $\frac{2}{3}$ of 5? - Anſ. 20.
11. What is the product of $\frac{2}{9}$ of $\frac{3}{5}$ and $\frac{5}{8}$ of $3\frac{2}{7}$? Anſ $\frac{23}{84}$.
12. What is the product of $3\frac{2}{7}$, and $4\frac{14}{33}$? - Anſ. $14\frac{124}{231}$.
13. What is the product of 5, $\frac{2}{3}$, $\frac{2}{7}$ of $\frac{3}{5}$, and $4\frac{1}{6}$?

Anſ. $2\frac{8}{21}$.

DIVISION OF VULGAR FRACTIONS.

RULE.

HAVING prepared the terms as in multiplication; take the quotient of the numerators and of the denominators, if they will exactly divide, for the numerator and denominator of the fraction required; but if that cannot be done, multiply the dividend by the *reciprocal* of the diviſor, for the quotient required.

Note. 1. By the reciprocal of a fraction, is meant the fraction got by inverting its terms: ſo the reciprocal of $\frac{2}{3}$ is $\frac{3}{2}$, and of 5 or $\frac{5}{1}$ is $\frac{1}{5}$.

Note 2. A fraction is divided by an integer by dividing the numerator by it, if poſſible; but if it will not exactly divide, then multiply the denominator by it.

EXAMPLES.

1. What is the quotient of $\frac{25}{9}$ by $\frac{5}{3}$?

$$\frac{25}{9} \div \frac{5}{3} = \frac{25 \div 5}{9 \div 3} = \frac{5}{3} = 1\tfrac{2}{3}.\quad \text{Anſ.}$$

2. What is the quotient of $\frac{5}{9}$ by $\frac{2}{15}$?

$$\frac{5}{9} \div \frac{2}{15} = \frac{5}{9} \times \frac{15}{2} = \frac{5 \times \overset{5}{\cancel{15}}}{\underset{3}{\cancel{9}} \times 2} = \frac{25}{6} = 4\tfrac{1}{6}.\quad \text{Anſ.}$$

3. What is the quotient of $\frac{16}{25}$ by $\frac{4}{5}$? - Anſ. $\frac{4}{5}$.
4. What is the quotient of $\frac{7}{16}$ by $\frac{3}{4}$? - Anſ. $\frac{7}{12}$.
5. What is the quotient of $\frac{14}{9}$ by $\frac{7}{6}$? - Anſ. $1\frac{1}{3}$.
6. What is the quotient of $\frac{5}{6}$ by $\frac{15}{7}$? - Anſ. $\frac{7}{18}$.
7. What is the quotient of $\frac{12}{35}$ by $\frac{3}{5}$? - Anſ. $\frac{4}{7}$.
8. What is the quotient of $\frac{2}{7}$ by $\frac{3}{5}$? - Anſ. $\frac{10}{21}$.
9. What is the quotient of $\frac{9}{16}$ by 3? - Anſ. $\frac{3}{16}$.
10. What is the quotient of $\frac{3}{5}$ by 7? - Anſ. $\frac{3}{35}$.
11. What is the quotient of 5 by $\frac{7}{10}$? - Anſ. $7\frac{1}{7}$.
12. What is the quotient of $7\frac{1}{3}$ by $9\frac{5}{9}$? - Anſ. $\frac{33}{43}$.
13. What is the quotient of $\frac{2}{3}$ of $\frac{1}{2}$ by $\frac{3}{7}$ of $7\frac{1}{5}$? Anſ. $\frac{7}{171}$

RULE-OF-THREE IN VULGAR FRACTIONS.

RULE

HAVING made the neceſſary preparations for Multiplication, multiply continually together the 2d and 3d terms and the reciprocal of the 1ſt, for the anſwer.

EXAMPLES.

1. If $\frac{3}{8}$ of a yard of velvet coſt $\frac{2}{5}$l, what will $\frac{5}{16}$ of a yard coſt?

$$\frac{3}{8} : \frac{2}{5} :: \frac{5}{16} : \frac{\cancel{5} \times \cancel{2} \times \cancel{8}}{\cancel{16} \times \cancel{5} \times 3} = \frac{1}{3}\text{l} = 6\text{s } 8\text{d, Anſ.}$$

Note. In this ſolution, having repreſented the 4th term in the form of a compound fraction, by expreſſing the continual product of the 2d term, and 3d term, and reciprocal of the firſt, as muſt always be done, then let the terms be always abbreviated as much as poſſible before the actual multiplication and diviſion; ſo here the one 5 cancels the other, and the 16 cancels the 2 and the 8, leaving only one third for the ſimple value of the 4th term required.

2. What will $3\frac{3}{8}$ oz of ſilver coſt at 6s 4d an ounce?
Anſ. 1l 1s $4\frac{7}{2}$d

3. If $\frac{3}{16}$ of a ſhip be worth 273l 2s 6d, what is $\frac{5}{32}$ of her worth?
Anſ. 227l 12s 1d.

4. What will $13\frac{2}{3}$lb coſt at the rate of $17\frac{5}{8}$l per cwt?
Anſ. 2l $3\frac{3}{224}$s

5. What is the purchaſe of 1230l bank-ſtock, at $108\frac{5}{8}$ per cent?
Anſ. 1336l 1s 9d.

6. What is the intereſt of 273l 15s for a year, at $3\frac{1}{4}$ per cent?
Anſ. 8l 17s $11\frac{1}{4}$d.

7. If $\frac{1}{8}$ of a ſhip be worth 73l 1s 3d, what part of her may I buy for 250l 10s?
Anſ. $\frac{3}{7}$ of her.

8. What muſt be paid for $5\frac{2}{9}$ oz at the rate of $5\frac{3}{4}$s per lb troy?
Anſ. 2s $6\frac{1}{36}$d.

9. How much India-ſtock may be bought for 3041l 2s 3d at $172\frac{3}{4}$l per cent?
Anſ. 1760l 8s 2d $3\frac{655}{691}$p.

10. What does the commiſſion of 530l 2s 9d amount to at 2s 6d per cent?
Anſ. 13s $3\frac{33}{800}$d.

11. How much Flemiſh money muſt be given for 273l 6s 8d ſterling, at the rate of 34s 6d Flemiſh per pound ſterling? - - - Anſ. 471l 10s.

12. How much South-ſea-ſtock, at 111$\frac{3}{8}$ per cent, will 10000l purchaſe? - - Anſ. 8978l 13s 6$\frac{46}{297}$d.

13. How much ſterling money muſt be given for 471l 10s Flemiſh, at the rate of 34s 6d Flemiſh for each pound ſterling? - - - Anſ. 273l 6s 8d.

RULE-OF-FIVE IN VULGAR FRACTIONS.

RULE.

TAKE the continual product of the three laſt, and the reciprocals of the two firſt terms, for the anſwer required.

EXAMPLES.

1. If 2l 10s be the wages of 15 men for 6 days, what will be the wages of 12 men for 18$\frac{1}{3}$ days?

$$\left.\begin{matrix}15\text{ men}\\ 6\text{ days}\end{matrix}\right\} : \frac{5}{2}\text{l} :: \left\{\begin{matrix}12\text{ men}\\ \frac{55}{3}\text{ days}\end{matrix}\right\} : 12\times\frac{55}{3}\times\frac{5}{2}\times$$

$$\frac{1}{15}\times\frac{1}{6}=\frac{\cancel{12}\times 55\times\cancel{5}}{3\times\cancel{2}\times\underset{3}{\cancel{15}}\times\cancel{6}}=\frac{55}{9}\text{l}=6\text{l } 2\text{s } 2\text{d } 2\tfrac{2}{3}\text{q.}\quad\text{Anſ.}$$

Note. In this ſolution, having put the fourth term required into the form of a compound fraction, it is abbreviated thus: the 12 cancels the 2 and the 6, and the 5 divides the 15, the quotient 3 being placed below it; then there is only 55 left for the numerator, and 3 to multiply by 3, producing 9 for the denominator, of the ſimple fraction required. And thus let every ſuch queſtion be managed, viz. put the terms of it into the form of a compound fraction, the multipliers all in the numerator, and the diviſors in the denominator, after which let this compound fraction be abbreviated as much as poſſible.

2. What is the intereſt of 350l for 18 months, at 5 per cent per annum? - - - Anſ. 26l 5s.

3. If I pay 16s 4d for the carriage of 5$\frac{1}{4}$ cwt 20 miles, what muſt be paid for the carriage of 17$\frac{3}{4}$cwt 7$\frac{1}{2}$ miles?
Anſ. 1l 8$\frac{1}{2}$d.

4. If a footman travel 273 miles in 6$\frac{2}{3}$ days of 12 hours long, in how many days of 9$\frac{1}{3}$ hours each may he travel 132 miles? - - - Anſ. 4$\frac{92}{637}$ days.

DECIMAL

DECIMAL FRACTIONS.

A Decimal is a fraction whoſe denominator is 1 with ſome number of ciphers annexed; as $\frac{1}{10}$, or $\frac{45}{10000}$. Decimals are written down without their denominators, the numerators being ſo diſtinguiſhed as to evince what the denominators are; which is done, by ſeparating, by a point ſo many of the right-hand figures from the reſt as there are ciphers in the denominator; the figures on the left hand ſide of the point being integers, and thoſe on the right decimals: So $\frac{13}{10}$ is written 1·3, and named 1 *and 3-tenths*; $\frac{15769}{1000}$ is written 15·769, and named 15 *and* 769 *thouſandth-parts*; and $\frac{250}{1000}$ is written ·25, and named 25 *hundredths* or *hundred parts.*—But if there be not a ſufficient number of figures in the numerator, ciphers are prefixed to ſupply the defect: So $\frac{1}{100}$ is written ·01, that is 1 *hundredth*; and $\frac{15}{10000}$ thus ·0015, that is 15 *ten thouſandths.*

So that the denominator of a decimal is always a 1 with as many ciphers as there are figures in the decimal.

Note 1. The 1ſt, 2d, 3d, 4th, &c. places of decimals, counting from the left-hand towards the right, are called the places of primes, ſeconds, thirds, and fourths, &c. reſpectively.

2. Ciphers on the right-hand of decimals do not alter their value.

ADDITION AND SUBTRACTION OF DECIMALS.

WRITE the propoſed numbers under each other, according to the value of their places, as in whole numbers; in which order the decimal points will ſtand directly below each other: then add or ſubtract as in whole numbers, placing a decimal point in the ſum or difference ſtraight below the other points.

EXAMPLES *in Addition.*

1. What is the ſum of 276, 39·213, 72014·9, 417, and 5032?

2. What is the ſum of 7530, 16·201, 3·0142, 957·13. 6·72119 and ·03014.

3. What is the ſum of 312·09, 3·5711, 7195·6, 71·498, 9739·215, 179, and ·0027?

4. What is the ſum of ·014, ·9816, ·32, ·15914, 72913 and 0047?

5. What is the ſum of 27·148, 918·73, 14016, 294304, ·713826, and 221·7?

EXAMPLES *in Subtraction.*

1. What is the difference between ·9173 and ·2138?
2. What is the difference of 1·9185 and 2·73?
3. What is the difference of 214·81 and 4·90142?
4. What is the difference of 91·713 and 407?
5. What is the difference of 2714 and ·916?

MULTIPLICATION *of* DECIMALS.

WRITE down the factors, and multiply exactly as in integers, placing the decimal point to the product, ſo as to make juſt as many decimals in it as there are in both factors; and if there be not as many figures in the product as their ought to be decimals, prefix ciphers to ſupply the defect.

EXAMPLES.

1. What is the product of ·417 and 520·3?
2. What is the product of 91·78 and ·381?
3. What is the product of ·217 and ·043?
4. What is the product of 51·6 and 21?
5. What is the product of 314 and ·029?
6. What is the product of ·051 and ·009?

CONTRACTIONS.

1. *When decimals are to be multiplied by* 1 *with any number of ciphers*; it is done by only removing the decimal point ſo many places farther to the right hand as there are ciphers in the multiplier, and ſubjoining ciphers if need be.

EXAMPLES.

1. The product of 51·3 and 1000 is 51300.
2. The product of 2·714 and 100 is

3. The product of ·9163 and 1000 is
4. The product of 21·31 and 10000 is

2. *When the product will contain many more decimals than are neceſſary for the preſent purpoſe, the work may be contracted thus.*

Write the units figure of the multiplier ſtraight under ſuch decimal place of the multiplicand as you intend the laſt of your product ſhall be, writing the other figures of the multiplier in an inverted order; then, in multiplying, reject all the figures in the multiplicand which are on the right of the figure you are multiplying by; writing the products down ſo, that their right-hand figures fall ſtraight below each other; and carrying to ſuch right-hand figures from the product of the two preceding figures in the multiplicand thus, viz. 1 from 5 to 15, 2 from 15 to 25, 3 from 25 to 35, &c. and the ſum of the lines will be the product to the number of decimals required, and will be ſeldom wrong in the laſt figure.

EXAMPLES.

1. Multiply 27·14986 by 92·41035, ſo as to retain only four places of decimals in the product.

Contracted.	*Common way.*	
27·14986	27·14986	
53014·29	92·41035	
24434874	13	574930
542997	81	44958
108599	2714	986
2715	108599	44
81	542997	2
14	24434874	
2508·9280	2508·9280	650510

2. Multiply 480·14936 by 2·72416, retaining four decimals in the product.

3. Multiply 2490·3048 by ·573286, retaining five decimals in the product.

4. Multiply 325·701428 by ·7218393, retaining three decimals in the product.

DIVISION *of* DECIMALS.

DIVIDE as in integers; and to know how many decimals muſt be in the quotient, obſerve the following rules:

RULE 1.

The firſt figure of the quotient muſt poſſeſs the ſame place of decimals or integers, as doth that figure of the dividend which ſtands over the units place of the firſt product.

RULE 2.

The decimal places of the diviſor and quotient together, muſt be equal in number to thoſe of the dividend.—Whence, if the number of decimals in the diviſor be taken from the number in the dividend, the remainder will be the number in the quotient.

Note. If, in any caſe, there be a remainder after all the dividend figures are uſed, the quotient may be continued to what number of decimals you pleaſe by ſubjoining a cipher continually to the laſt remainder.

And whenever the number of figures in the quotient is leſs than the required number of decimals, prefix ciphers to ſupply the defect.

EXAMPLES.

·14) 7201·93 (3·75) 3·15 (
7·13) 18 (·215) ·109 (

CONTRACTIONS.

1. *If the diviſor be an integer with any number of ciphers at the end*, cut them off, and remove the decimal point in the dividend as many places farther to the left as there were ciphers cut off, prefixing ciphers if need be; then proceed as before.

EXAMPLES.

21/0) 45·5 (32000) 41020 (
21000) 953 (79000) 61 (

2. Whence, *if the diviſor be* 1 *with ciphers*, the quotient will be the ſame figures with the dividend, having the decimal point as many places farther to the left as there are ciphers in the diviſor.

EXAMPLES.

217·3 ÷ 100 = 2·173 419 by 10 =
5·16 by 1000 = ·21 by 1000 =

3. *When the number of figures in the diviſor is great*, the diviſion at large will be very troubleſome, but may be contracted thus:

Having by the firſt general rule found what place of decimals or integers the firſt figure of the quotient will poſſeſs; conſider how many figures of the quotient will ſerve the preſent purpoſe; then take the ſame number of the left-hand figures of the diviſor, and as many of the dividend figures as will contain them (leſs than 10 times;) by theſe find the firſt figure of the quotient, and for each following figure divide the laſt remainder by the diviſor wanting one figure to the right more than before, but obſerving what muſt be carried to the firſt product for ſuch omitted figures as in the ſecond contraction of multiplication; and continue the operation till the diviſor is exhauſted.

Note. When there are not as many figures in the diviſor as are required to be in the quotient, begin the diviſion with all the figures as uſual, and continue it till the number of figures in the diviſor, and thoſe remaining to be found in the quotient be equal, after which uſe the contraction.

EXAMPLES.

1. Divide 2508·92806 by 92·41035, ſo as to have four decimals in the quotient, in which caſe the quotient will contain ſix figures.

Contracted.	*Common way.*
92·4103,5) 2508·928,06 (27·1498	92·4103,5) 2508·928,06 (27·1498
660721	66072106
13849	13848610
4608	46075750
912	91116100
80	79467850
6	5539570

2. Divide 4109·2351 b7 230·409 ſo that the quotient may contain four decimals.

3. Divide 37·10438 by 5713 96 that the quotient may contain five decimals.

4. Divide 913·08 by 2137·2 that the quotient may contain three decimals.

REDUCTION OF DECIMALS.

*I. *TO reduce a vulgar fraction to an equivalent decimal.*

RULE.

Divide the numerator by the denominator as in diviſion of decimals, and the quotient will be the decimal required.

EXAMPLES.

Reduce $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{6}$, $\frac{1}{7}$, $\frac{1}{8}$, and $\frac{1}{9}$ to decimals.
Reduce $\frac{2}{7}$ to a decimal.
Reduce $\frac{14}{191}$ to a decimal.
Reduce $\frac{21}{738}$ to a decimal.

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* Since to throw any vulgar fraction, whoſe denominator is a prime number greater than what it is common to divide by in one line, into a decimal, conſiſting of a great number of figures, has engaged the attention of many eminent perſons, I ſhall here ſet down the method which Mr. Colſon has given in page 162 of Sir Iſaace Newton's fluxions; which method performs the work much ſooner than any other that I know of.

The method will be beſt explained by an example, thus: "Suppoſe (for inſtance) I would find the reciprocal of the prime number 29, or the value of the fraction $\frac{1}{29}$ in decimal numbers. I divide 10000 by 29, in the common way, ſo far as to find two or three of the firſt figures, or till the remainder becomes a ſingle figure, and then I aſſume the ſupplement to complete the quotient. Thus I ſhall have $\frac{1}{29} = 0{\cdot}03448\,\frac{8}{29}$ for the complete quotient; which equation, if I multiply by the numerator 8, it will give $\frac{8}{29} = 0{\cdot}27584\frac{64}{29}$ or rather $\frac{8}{29} = 0{\cdot}27586\,\frac{6}{29}$. I ſubſtitute this inſtead of the fraction in the firſt equation, and I ſhall have $\frac{1}{29} = 0{\cdot}0344827586\frac{6}{29}$. Again, I multiply this equation by 6, and it will give $\frac{6}{29} = 0{\cdot}2068965517\frac{7}{29}$, and then by ſubſtitution $\frac{1}{29} = 0{\cdot}03448275862068965517\frac{7}{29}$. Again, I multiply this equation by 7 and it becomes $\frac{7}{29} = 0{\cdot}24137931034482758620\frac{10}{29}$, and then by ſubſtitution $\frac{1}{29} = 0{\cdot}0344827586206896551724137931034482786 20\frac{10}{29}$, where every operation will at leaſt double the number of figures found by the preceding operation. And this will be an eaſy expedient for converting diviſion into multiplication in all caſes. For this reciprocal of the diviſor being thus found, it may be multiplied into the dividend to produce the quotient."

II. *To reduce a decimal of a ſuperior denomination to its value in the inferior ones.*

RULE.

Multiply the given decimal by ſuch a number as will reduce it to the next inferior name, and point off in the product as many places of decimals as are in the given number; then reduce theſe in the ſame manner to the next name; and ſo continue the reduction to the loweſt name required, or till the decimals pointed off be all ciphers; then the numbers on the left of the points will expreſs the value of the decimal.

EXAMPLES.

1. What is the value of ·775l ? . Anſ. 15s 6d.
2. What is the value of ·625 ſhil ? - Anſ. 7½d.
3. What is the value of ·8635l ? Anſ. 17s 3·24d.
4. What is the value of ·0125 lb troy ? Anſ. 3 dwts.
5. What is the value of ·4694 lb troy ? Anſ. 5 oz 12 dwt 15·744 gr.
6. What is the value of ·625 cwt ? Anſ. 2 qr 14lb.
7. What is the value of ·009943 miles ? Anſ. 17 yd 1 ft 5·98848 inc.
8. What is the value of ·6875 yd ? Anſ. 2 qr 3 nls.
9. What is the value of ·3375 acr ? Anſ. 1 rd 14 poles.
10. What is the value of ·2083 hhd of wine ? Anſ. 13·1229 gal.
11. What is the value of ·40625 qr of corn ? Anſ. 3 buſh. 1 peck.
12. What is the value of ·42857 month ? Anſ. 1 we 4ds 23·99904 hrs.

III. *To reduce integers or decimals to equivalent decimals of ſuperior denominations.*

CASE I.

If a ſimple number or decimal be propoſed, reduce it to the name required by dividing as in reduction of integers.

EXAMPLES.

EXAMPLES.

1. Reduce 1 dwt to the decimal of a lb.
Anſ. ·004166 &c. lb.
2. Reduce 9d to the decimal of a pound. Anſ. ·0375 l.
3. Reduce 7 drams to the decimal of a lb avoird.
Anſ. ·02734375lb.
4. Reduce ·26 d to the decimal of a l.
Anſ. ·0010833 &c l.
5. Reduce 2·15 lb to the decimal of a cwt.
Anſ. ·019196+cwt.
6. Reduce 24 yards to the decimal of a mile.
Anſ. ·013636 &c miles.
7. Reduce ·056 poles to the decimal of an acre.
Anſ. ·00035 ac.
8. Reduce 1·2 pints of wine to the decimal of a hhd.
Anſ. ·00238+hhd.
9. Reduce 14 minutes to the decimal of a day.
Anſ. ·009722 &c da.
10. Reduce ·21 pints to the decimal of a peck.
Anſ. ·013125 pec.

CASE 2.

A compound number may be reduced to a ſuperior name, by reducing each of its parts, and taking the ſum of the decimals; the beſt way to do which is thus:

Write the given numbers under each other, proceeding orderly from the leaſt to the greateſt name, for dividends; draw a perpendicular line on the left of theſe, and on the left of it write oppoſite to each dividend ſuch a number, for a diviſor, as will reduce it to the next ſuperior name; then begin with the upper diviſion, and affix the quotient of each to the next dividend, as a decimal part of it, before it be divided, and the laſt ſum will be the anſwer.

EXAMPLES.

1. Reduce 3l 12s 6$\frac{3}{4}$d to the denomination of pounds.

4	3
12	6·75
20	12·5625
	3·628125 Anſ.

2. Reduce 19l 17s $3\frac{3}{4}$d to l. Anſ. 19·86354166 &c l.
3. Reduce 15s 6d to the decimal of l. Anſ. ·775l.
4. Reduce $7\frac{1}{2}$d to the decimal of a ſhil. Anſ. ·625s.
5. Reduce 5 oz 11 dwts 16 gr to lbs. Anſ. ·46944 &c lb.
6. Reduce 3 cwt 2 qr 14 lb to cwts. Anſ. 3·625 cwt.
7. Reduce 17 yd 1 ft 6 inc to the decimal of a mile. Anſ. ·0099431818 &c mil.
8. Reduce 1 qr 3 nls to the decimal of a yard. Anſ. ·6875 yd.
9. Reduce 13 ac 1 ro 14 pol to acres. Anſ. 13·3375 acr.
10. Reduce 13 gal 1 pint of wine to the decimal of a hhd. Anſ. ·20833 &c hhd.
11. Reduce 3 buſh 1 peck to the decimal of a quarter. Anſ. ·40625 qr.
12. Reduce 3 mo 1 we 5 da to months. Anſ. 3·42857+mon.

RULE-OF-THREE IN DECIMALS.

REDUCE vulgar fractions to decimals, and compound numbers either to decimals of the higher names, or to integers of the lower, as alſo the firſt and third to the ſame name: Then ſtate the queſtion, and proceed as in integers.

Note. Any of the convenient examples in the rule-of-three or rule of five in integers, or vulgar fractions, may be taken as proper examples to the ſame rules in decimals; for it would be filling the Book to ill purpoſe to give different examples here—The following example, which is the firſt in vulgar fractions, is wrought here to ſhew the method.

If $\frac{3}{8}$ of a yard of velvet coſt $\frac{2}{5}$l, what will $\frac{5}{16}$ yd coſt?

yd l yd l s d
$\frac{3}{8}$ = ·375 ·375 : ·4 : : ·3125 : ·333 &c or 6 8
·4
$\frac{2}{5}$ = ·4 ·375)·12500 (·333333 &c.
1250 20
$\frac{5}{16}$ = ·3125 125 s. 6·66666 &c
12
Anſ. 6s 8d. d. 7·99999 &c = 8d.

Note. The remainder in the dviſion being always the ſame, the quotient figure muſt be ſo likewiſe; ſo that if the quotient were infinitely continued it would be equal to $\frac{1}{3}$l, as in vulgar fractions.

RULE-OF-FIVE IN DECIMALS.

THE ſame preparations muſt be uſed here as in the rule-of-three, before the ſtating; after which, proceed as in integers.

EXAMPLES.

1. If 2l 10s be the wages of 15 men for 6 days, what will be the wages of 12 men for 18$\frac{1}{3}$ days?

Here 2l 10s = 2·5l, and 18$\frac{1}{3}$ = 18·333 &c. Then

$$\left.\begin{array}{r}15\\6\\\hline 90\end{array}\right\} : 2\cdot5 :: \left\{\begin{array}{r}18\cdot333\\12\\\hline 220\\215\\\hline 110\\44\\\hline 90)550\cdot0\\\pounds\,6\cdot11111\ \&c\\20\\\hline s.\ 2\cdot2222\\12\\\hline d.\ 2\cdot6666\\4\\\hline q.\ 2\cdot6666\end{array}\right\} : \overset{l}{6\cdot111}\ \&c\ \text{or}\ \overset{l}{6}\ \overset{s}{2}\ \overset{d}{2\tfrac{1}{2}}$$

Anſ. 6l 2s 2$\frac{1}{2}$d.

For more examples, take any of thoſe in the rule-of-five in vulgar fractions, or whole numbers.

SIMPLE INTEREST.

INTEREST is the premium allowed for the loan of money.

The ſum lent is called the *principal.*

The ſum of the principal and intereſt is called the amount.

Intereſt is allowed at ſo much *per cent per annum*, which premium *per cent per annum*, or intereſt of 100l for a year, is called the rate of intereſt.

Intereſt is of two ſorts, *ſimple* and *compound*.

Simple intereſt is that which is allowed for the principal lent only.

Note. The rules for ſimple Intereſt ſerve alſo to calculate commiſſion, brokage, inſurance, ſtocks, or any thing elſe rated at ſo much per cent.

RULES.

I. *To find the intereſt for a year*, multiply the principal by the rate, and divide the product by 100.

Note. When the rate is a convenient aliquot part of 100, or can be divided into ſeveral ſuch parts of 100, take the ſame part or parts of the principal for the intereſt of a year.

EXAMPLES.

1. What is the intereſt of 450l for a year, at 5 per cent per annum? - - - Anſ. 22l 10s.

2. What is the intereſt of 230l 10s at 4 per cent per annum? - - - Anſ. 9l 4s 4d $3\frac{1}{5}$q.

3. What is the intereſt of 715l 12s 6d at $4\frac{1}{2}$ per cent per annum? - - - Anſ. 32l 4s 0$\frac{3}{4}$d.

II. *To find the intereſt for ſeveral years*, multiply the intereſt of one year by the number of them.

Note. When there are ſeveral years, or ſeveral years with ſome parts of a year, it is commonly beſt to multiply them by the rate, and divide the product into aliquot parts of 100, taking the ſame parts of the principal for the anſwer.

EXAMPLES.

1. What is the intereſt of 720l for 3 years, at 5 per cent per annum? - - - Anſ, 108l.

2. What is the intereſt of 355l 15s for 4 years, at 4 per cent per annum? - - Anſ. 56l 18s 4d $3\frac{1}{5}$q.

3. What is the intereſt of 32l 5s 8d for 7 years, at $4\frac{1}{4}$ per cent per annum? - - Anſ. 9l 12s $1\frac{3}{100}$d.

III. *If there be any parts of a year, as* $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, &c, the intereſt for them is found by taking the ſame parts of one year's intereſt, when it is not convenient to uſe the note in the laſt caſe.

EXAMPLES.

1. What is the intereſt of 170l for $1\frac{1}{2}$ year, at 5 per cent per annum? - - Anſ. 12l 15s.

2. What is the intereſt of 205l 15s for $\frac{1}{4}$ of a year, at 4 per cent per annum? - Anſ. 2l 1s 1d $3\frac{1}{5}$q.

3. What is the intereſt of 319l 6d for $5\frac{3}{4}$ years, at $3\frac{3}{4}$ per cent per annum? - Anſ. 68l 15s 9d $2\frac{7}{40}$q.

IV. *For any number of days*, multiply the intereſt of a year by them, and divide by 365.

A TABLE *ſhewing the number of days from any day of one month to the ſame day of any other month.*

To	From any day of											
	Jan.	Feb.	Ma.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Jan.	365	334	300	275	245	214	184	153	122	92	61	31
Feb.	31	365	337	301	276	245	215	184	153	123	92	62
Mar.	59	28	365	334	304	273	243	212	181	151	12	90
Apr.	90	59	31	365	335	304	273	243	212	182	151	121
May	120	89	61	30	365	334	304	273	242	212	181	151
June	151	120	92	61	31	365	335	304	273	243	212	182
July	181	150	122	91	61	30	365	334	303	273	242	212
Aug.	212	181	153	122	92	61	31	365	334	304	273	243
Sept.	243	212	184	153	123	91	62	31	365	335	304	274
Oct.	273	242	214	183	153	122	92	61	30	365	334	304
Nov.	304	273	245	214	184	153	123	92	61	31	365	335
Dec.	334	303	275	244	214	183	153	122	91	61	30	365

Note. In leap year, if the end of the month of Febuary be in the time one day muſt be added, on that account.

EXAMPLES.

1. What is the intereſt of 107l for 117 days, at $4\frac{3}{4}$ per cent per annum? - - Anſ. 1l 12s $7\frac{8}{1825}$d.

2. What is the amount of 120l from Jan. 7, to Sept, 12, 1787, at 4 per cent per annum? Anſ. 123l 5s 2d $2\frac{334}{365}$q.

3. What is the intereſt of 213l from Feb. 12, to June 5, 1788, it being leap year, at $3\frac{1}{2}$ per cent per annum?

Anſ. 2l 6s 6d $3\frac{301}{1823}$q.

N. B. The following is a neat and conciſe method for working ſimple intereſt for any number of days, at any rate of intereſt.

Numb.	l	s	d	q	Nu.	l	s	d	q	Nu.	d	q
1000000	2739	14	6	0·99	3000	8	4	4	2·41	5	3	1·15
900000	2465	15	0	3·2	2000	5	9	7	0·27	4	2	2·52
800000	2191	15	7	1·59	1000	2	14	9	2·14	3	1	3·89
700000	1917	16	1	3·8	900	2	9	3	3·12	2	1	1·26
600000	1643	16	8	2·1	800	2	3	10	0·11	1	0	2·63
500000	1369	17	3	0·49	700	1	18	4	1·10	0·9	0	2·37
400000	1095	17	9	2·79	600	1	12	10	2·08	0·8	0	2·10
300000	821	18	4	1·10	500	1	7	4	3·07	0·7	0	1·84
200000	547	18	10	3·40	400	1	1	11	0·05	0·6	0	1·58
100000	273	19	5	1·70	300	0	16	5	1·04	0·5	0	1·32
90000	246	11	6	0·33	200	0	10	11	2·03	0 4	0	1·05
80000	219	3	6	2·96	100	0	5	5	3·01	0·3	0	0·79
70000	191	15	7	1·59	90	0	4	11	0·71	0·2	0	0·53
60000	164	7	8	0·22	80	0	4	4	2·41	0·1	0	0·26
50000	136	19	8	2·85	70	0	3	10	0·11	0·09	0	0·24
40000	109	11	9	1·48	60	0	3	3	1.81	0·08	0	0·21
30000	82	3	10	0·11	50	0	2	8	3·51	0·07	0	0·18
20000	54	15	10	2·74	40	0	2	2	1·21	0·06	0	0·16
10000	27	7	11	1·37	30	0	1	7	2·90	0·05	0	0·13
9000	24	13	1	3·23	20	0	1	1	0·60	0·04	0	0·11
8000	21	18	4	1·10	10	0	0	6	2·30	0·03	0	0·08
7000	19	3	6	2·96	9	0	0	5	3·67	0·02	0	0·05
6000	16	8	9	0·82	8	0	0	5	1·04	0·01	0	0·03
5000	13	13	11	2·68	7	0	0	4	2·41			
4000	10	10	2	0·55	6	0	0	3	3·78			

RULE.

Multiply the principal by the rate, both in pounds; multiply the product by the number of days, and divide this laſt product by 100; then take from the table the ſeveral ſums which ſtand oppoſite the ſeveral parts of the quotient, and add them together for the intereſt required.

EXAMPLES.

1. What is the intereſt of 225l 10s for 23 days, at $4\frac{1}{2}$ per cent per annum?

princ. 225·5
rate 4·5

1014·74
75 days 23

1·0) 23339·25

233·39925

Then in the table

	l	s	d	q
againſt 200 is	0	10	11	2·03
30 —	0	1	7	2·90
3 —	0	0	1	3·89
0·3 —	0	0	0	0·79
0·09 —	0	0	0	0·24
Anſ.	0	12	9	1·85 true

in the laſt place of decimals.

2. What is the intereſt of 17l 5s for 117 days, at $4\frac{3}{4}$ per cent per annum? - - Anſ. 5s 3d 0·12q.

3. What is the intereſt of 112l 12s 6d from the 8th of May, to the 3d of November, at 4 per cent per annum?
Anſ. 2l 4s 2d 0·92q.

QUESTIONS

Concerning *Brokage*, *Commiſſion*, *Inſurance*, *and Stocks*.

Brokage is the allowance made to brokers for aſſiſting others in buying or diſpoſing of their goods.

Factorage, *proviſion*, or *commiſſion*, is an allowance made to factors or agents beyond ſea, for buying or ſelling goods for their employers.

Inſurance is ſecurity given, in conſideration of a premium paid down, to reſtore, to a certain value, for which the premium is advanced, the loſs or damage on ſhips, houſes, goods, &c. by ſtorms, fire, &c. But in the calculations, the word *inſurance* is commonly written for premium.

Stocks are the public funds of the nation; the ſhares of which being transferrable from one perſon to another, occaſion the extenſive buſineſs of ſtock-jobbing.

EXAMPLES.

1. What is the brokage of 610l at 5s or $\frac{1}{4}$ per cent?
Anſ. 1l 10s 6d.

2. What is the brokage of 372l 7s 4d at 4s 6d per cent?
Anſ. 16s $9\frac{39}{500}$d.

3. What is the factorage of 920l at $3\frac{1}{2}$ per cent?
Anſ. 32l 4s.

4. What is the commiſſion of 508l 17s 10d at $1\frac{1}{2}$ per cent?
Anſ. 7l 12s $8\frac{1}{100}$d.

5. What is the inſurance of 900l at $10\frac{3}{4}$ per cent?
Anſ. 96l 15s.

6. What is the inſurance of 712l 6s for 8 months, at $7\frac{1}{2}$ per cent. per annum? - Anſ. 35l 12s 3d $2\frac{2}{5}$q.

7. What is the purchaſe of 1200l ſouth-ſea ſtock, at $103\frac{5}{8}$ per cent? - - - Anſ. 1243l 10s.

8. What is the purchaſe of 912l 14s bank-ſtock, at $127\frac{3}{4}$ per cent. - - Anſ. 1165l 19s 5d $3\frac{7}{25}$q.

9. What is the purchaſe of 2380l India-Stock, at $147\frac{1}{4}$ per cent? - - - Anſ. 3504l 11s.

10. What is the purchaſe of 816l 12s bank annuities, at $89\frac{3}{8}$ per cent? - - Anſ. 729l 16s 8d $2\frac{4}{5}$q.

COMPOUND INTEREST.

COMPOUND intereſt is that which is allowed, not only for the ſum lent, but alſo for its intereſt; as it becomes due at the end of each ſtated time of payment.

RULES.

I. Find the amount of the given principal for the time of the firſt payment, by ſimple intereſt; then conſider this amount as the principal for the ſecond payment, whoſe amount calculate in the ſame manner; and ſo on through all the payments, ſtill accounting the laſt amount as the principal of the next payment, *Or*,

II. Find the amount of one pound for the time of the firſt payment, and multiply it by itſelf ſo often as are the number of payments wanting 1, that is, twice by itſelf if there be three payments, thrice if there be four, &c; then the laſt product multiplied by the principal, gives the whole amount.

Note 1. The following table, adapted for the uſe of the ſecond rule, contains the amount of 1 pound for each of the firſt ten years or payments, at ſeven ſeveral rates of intereſt, from 2 and a half to 6 per cent, and therefore any one of theſe numbers multiplied by a given ſum, produces its amount for the coreſponding rate and time.

No	2½	3	3½	4	4½	5	6
1	1·025	1·03000	1·03500	1·04000	1·04500	1·05000	1·06000
2	1·05062	1·06090	1·07122	1·08160	1·09202	1·10250	1·12360
3	1·07689	1·09273	1·10872	1·12486	1·14117	1·15762	1·19102
4	1·10381	1·12551	1·14752	1·16986	1·19252	1 21551	1·26248
5	1·13141	1·15927	1·18769	1·21665	1·24618	1·27628	1·33823
6	1·15969	1·19405	1·22926	1·26532	1·30226	1·34010	1·41852
7	1·18869	1·22987	1·27228	1·31593	1·36086	1·40710	1·50363
8	1·21840	1·26677	1·31681	1·36857	1·42210	1 47746	1·59385
9	1·24886	1·30477	1·36290	1·42331	1·48610	1 55133	1·68948
10	1·28008	1·34392	1·41060	1·48024	1·55297	1·62889	1·79085

Note 2. It is not neceſſary that the payments ſhould be yearly; for the rule will hold whether they be yearly, half-yearly, quarterly, monthly, or any other aliquot part of a year; but there muſt be a complete integer number of the times of payments, not a certain number of times and part of another, for the rule takes no notice of ſuch parts, nor will it be juſt to calculate for a complete time and take the ſame part of the reſult as is the part of the time; though in this manner have ſome authors falſely calculated ſome of their examples. It is poſſible to perform all ſuch calculations, both parts of times and whole ones, without logarithms, though the trouble is, in ſome caſes, intolerable: but by the logarithms it is as eaſy to perform the calculations with parts of times of payments, as with whole ones.

EXAMPLES.

1. What will 50l amount to in 5 years, at 5 per cent per annum, compound intereſt? - Anſ. 63l 16s 3¼d.

2. What will 50l. ſuppoſing the intereſt payable half-yearly, amount to in 5 years, or 10 half-years, at 5 per cent per annum, compound intereſt? - Anſ. 64l 1d.

3. What will 50l, the intereſt payable quarterly, amount to in 5 years, at 5 per cent per annnm, compound intereſt?
Anſ. 64l 2s 0¼d.

4. What is the compound intereſt of 370l, forborn 6 years, at 4 per cent per annum? - Anſ. 98l 3s 4¼d.

5. What is the compound intereſt of 410l, forborn 2½ years, at 4½ per cent per annum, ſuppoſing the intereſt payable half-yearly? - - Anſ. 48l 4s 11¼d.

6. What is the amount of 217l, forborn 2¼ years, at 5 per cent per annum, ſuppoſing the intereſt payable quarterly?
Anſ. 242l 13s 4½d.

DISCOUNT.

DISCOUNT.

REBATE or *Diſcount* is the difference between a ſum of money due at a certain time to come, and its preſent worth.

The *preſent worth* of any ſum or debt, due ſome time hence, is ſuch a ſum, as if put to intereſt, would in the time and at the rate for which the diſcount is to be made, amount to the ſum or debt then due.

RULE.

As the amount of 100l for the given rate and time :
Is to the given ſum or debt ::
So is 100l to the preſent worth, or
So is the intereſt of 100l for the given time ::
To the diſcount of the given ſum.

Note 1. The meaning of four things written in the form above, is that they are the four terms of a rule-of-three queſtion.

2. "The method uſed among bankers in diſcounting bills, is to find the intereſt of the ſum drawn for, from the time the bill is diſcounted, to the time when it becomes due, (including the days of grace) which intereſt they reckon as the diſcount, thereby making the diſcount more than it really is."

But when goods are bought or ſold, and diſcount is to be made for preſent payment, at any rate per cent without regard to time, the intereſt of the ſum as calculated for a year is the diſcount.

EXAMPLES.

1. What is the preſent worth of 700l, due 9 months hence, diſcount at 5 per cent per annum? Anſ. 674l 13s 11d $2\frac{70}{83}$q.

2. What is the diſcount of 312l for 6 months, at 6 per cent per annum? - - Anſ. 9l 1s 8d $3\frac{91}{103}$q.

3. What is the rebate of 125l 10s, payable 10 months hence, at $4\frac{1}{2}$ per cent per annum? Anſ. 4l 10s 8d $2\frac{58}{83}$q.

4. What is 217l 4s 6d, due 5 months hence, worth in preſent money, diſcount at $5\frac{1}{2}$ per cent?
Anſ. 212l 7s $2\frac{14}{491}$d.

5. How much ready money for a note of 73l, due 17 months hence, diſcount at 5 per cent per annum?
Anſ. 68l 3s $5\frac{23}{257}$d.

6. Sold goods to the amount of 83l 6s, to be paid 6

months hence; what muſt I have in preſent money, diſcount at 8 per cent per annum? Anſ. 80l 1s $11\frac{1}{13}$d.

7. Bought goods to the value of 35l 8s, to be paid 8 months hence; what muſt I pay in preſent money, diſcount at 7 per cent per annum? - - Anſ. 33l 16s $5\frac{31}{157}$d.

8. If a legacy of 600l be left me on the 3d of May, to be paid on the Chriſtmas-day following; what muſt I receive when I allow 5 per cent per annum diſcount for preſent payment? - - Anſ. 581l 4s 2d $1\frac{123}{157}$q.

9. What is the preſent worth of 60l, payable at two 3 months, at 5 per cent per annum diſcount?

Anſ. 58l 17s 11d $2\frac{2}{2369}$q.

10. What is the preſent worth of 120l, payable as follows, viz. 50l at three months, 50l at 5 months, and the reſt at 8 months, diſcount at 6 per cent per annum?

Anſ. 117l 5s $5\frac{1}{4}$d.

EQUATION OF PAYMENTS.

EQUATION of payments is the finding a time, when if a ſum of money be paid which is equal to the ſum of ſeveral others due at different times, no loſs will be ſuſtained by either party.

*The * common rule is this:*

Multiply each payment by the time it is due at, then dividing the ſum of the products by the ſum of the payments, the quotient is the equated time.

EXAMPLES.

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* The rule for two payments at Simple Intereſt is this:

If p be the firſt payment, and t the time till it be due; alſo $P =$ any other payment, and $T =$ its time; moreover if r be one year's intereſt of 1l; put $a = T + t + \frac{P + p}{pr}$, and $c = Tt + \frac{PT + pt}{pr}$, then $\frac{1}{2}a \pm \frac{1}{2}\sqrt{a2 - 4c}$ is the equated time for theſe two payments.

Or if t be taken $= 0$, then s $a = T + \frac{P + p}{pr}$, and $c = \frac{PT}{p}$.

T being

EXAMPLES.

1. There is a debt of 60l to be paid, 30l at 2 months, and 30l at 4 months; but if it be reduced to one payment, at what time muſt it be made? - Anſ. at 3 months.

2. A debt of 120l due as follows, viz. 50l at 2 months, 40l at five months, and the reſt at 7 months; when muſt the whole be paid? - - Anſ. at $4\frac{1}{4}$ mo.

3. A debt of 500l is to be diſcharged thus, viz. 100l preſent, 300l at 4 months, and the reſt at 6 months: what is the equated time for the whole? - Anſ. $3\frac{3}{5}$ mo.

4. A debt is to be diſcharged by paying $\frac{1}{2}$ at 3 months, $\frac{1}{3}$ at 5 months, and the reſt at 6 months: what is the equated time for the whole? - - Anſ. $4\frac{1}{6}$ mo.

5. A debt is to be diſcharged thus, viz. $\frac{1}{4}$ preſent, and $\frac{1}{4}$ every 3 months after, till the whole be diſcharged: what is the equated time for the whole? - Anſ. $4\frac{1}{2}$ mo.

SINGLE FELLOWSHIP.

SINGLE Fellowſhip is a rule by which any ſum or quantity may be divided into any aſſigned number of parts which ſhall be proportional to ſo many other propoſed numbers, each to each.

T being then the difference between the two times of payment; theſe values of *a* and *c* being uſed in the ſame theorem $\frac{1}{2}a \pm \frac{1}{2}\sqrt{a^2-4c}$, it will determine how long after the firſt payment is due, the whole, or ſum of the two muſt be paid.

This rule is the induſtrious Mr. *Malcolm's* —*Kerſey's* rule, which ſeveral have given as the true method of computing equation of payments, is falſe; otherwiſe it would bring out the ſame anſwer as Malcolm's, againſt the truth of whoſe rule for only two payments I believe no objection was ever made; but as they bring out different anſwers when ſimple intereſt is uſed (and it does not appear that the authors of them propoſed to uſe any other) they cannot both of them be true.

When three or more payments are to be equated for, then Malcolm's method of firſt equating for two, and next for their reſult and a third, &c. is not ſtrictly true. But in all ſuch caſes, to obtain the juſt anſwer, Malcolm's general principle of ſolution ought to be uſed, viz. making the intereſts of the ſums that are kept till after they are due, equal to the diſcounts of thoſe which are paid before they are due. The reſolution of the reſulting eqnation will indeed require ſome knowledge in Alegbra. Bur for ordinary uſe, the common rule will bring out anſwers ſufficiently near the truth.

By this rule are adjuſted the gain or loſs or charges of merchants in company, the effects of bankrupts, legacies in caſe of a deficiency of aſſets, *&c.*

Rule

Make the ſum of the numbers, to which the required parts muſt be proportional, the firſt term; the quantity to be parted or divided, the ſecond; and each of the given numbers, to which the required ones muſt be proportional, the ſeveral third terms, of ſo many rule of three queſtions; the fourth terms of which will be the reſpective parts required.

Note 1. The firſt and third contractions of rhe rule-of-three, are the beſt for working queſtions in this rule; becauſe the two firſt terms of all the ſtatings being the ſame, there will be had a conſtant multiplier or diviſor for the third terms.

2. When two or more of the terms, to which the required ones muſt be proportional, are equal, ſo many operations will be ſaved as there are equalities.

Examples.

1. Divide the number 120 into 3 ſuch parts as ſhall be to each other as 1, 2, and 3. - Anſ. 20, 40, and 60.

2. Two merchants, A and B, trade together? A puts into the ſtock 60l, and B puts in 40l; and they gain by trading 24l: what are their ſhares of it?

Anſ. A's ſhare is 14l 8s, and B's 9l 12s.

3. Two merchants, C and D, made a ſtock of 120l; of which C contributed 75l; by trading they loſt 30l; what muſt each ſuſtain of it? Anſ. C 18l 15s, and D 11l 5s.

4. Three merchants, whoſe ſtock is 700l, of which E contributed 123l, F 358l, and G the reſt, gain by trading 125l 10s; what muſt each have of it?

Anſ. E muſt have 22l 1s 0d $2\frac{2}{35}$q.
F - 64 3 8 $0\frac{32}{35}$
G - 39 5 3 $1\frac{1}{35}$

5. Three merchants, H, I, and K, freighted a ſhip with 340 tuns of wine, of which H loaded 110 tuns, I 97, and K the reſt; in a ſtorm the ſeamen were obliged to throw overboard 85 tuns; how much muſt each ſuſtain of the loſs?

Anſ. H $27\frac{1}{2}$, I $24\frac{1}{4}$, and K $33\frac{1}{4}$ tuns.

6. A piece of ground, conſiſting of 37ac 2ro 14 ps, is to be divided among three perſons, L, M, and N, in proportion to their eſtates: now if L.'s eſtate be worth 500l a year, M's 320l, and N's 75l; what quantity of land muſt each one have?

Anſ. L muſt have 20 ac 3 ro $39\frac{139}{179}$ps.
M - 13 1 $30\frac{46}{179}$
N - 3 0 $23\frac{173}{179}$

7. A perſon is indebted to O 57l 15s, to P 108l 3s 8d, to Q 22 10d, and to R 73l; but at his deceaſe, his effects are found to be worth no more than 170l 14s: how muſt it be divided among his creditors?

Anſ. O muſt have 37l 15s 5d $2\frac{5302}{10419}$q.
P - 70 15 2 $2\frac{7498}{10419}$
Q - 14 8 4 $0\frac{4720}{10419}$
R - 47 14 11 $2\frac{3338}{10419}$

8. A ſhip worth 900l, being entirely loſt, of which $\frac{1}{8}$ belonged to S, $\frac{1}{4}$ to T, and the reſt to V; what loſs will each ſuſtain, ſuppoſing 540l of her were inſured?

Anſ. S will loſe 45l, T 90l, and V 225l.

9. Four perſons, W, X, Y, and Z, ſpent among them 25s, and agree that W ſhall pay $\frac{1}{2}$ of it, X $\frac{1}{3}$, Y $\frac{1}{4}$, and Z $\frac{1}{5}$; that is, their ſhares are to be in proportion as $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, and $\frac{1}{5}$, what are their ſhares;

Anſ. W muſt pay 9s 8d $3\frac{41}{77}$q.
X - 6 5 $3\frac{53}{77}$
Y - 4 10 $1\frac{59}{77}$
Z - 3 10 $3\frac{1}{77}$

DOUBLE FELLOWSHIP.

WHEN the ſhares of partners are continued in company unequal times, they occaſion the name *fellowſhip with time*, or *double-fellowſhip*: which is performed by the following

RULE.*

Multiply each ſhare by the time of its continuance; then divide

---

* Mr. Ward has given an analytical inveſtigation of this rule, and Mr. Malcolm has given the reaſon of it in a manner evident enough; but I think the moſt general and elegant manner of proof is thus:

When

divide the gain or loſs in proportion to the products, as in ſingle fellowſhip, by ſaying as the ſum of the products is to the whole gain or loſs, ſo is each product, to each part of it.

EXAMPLES.

1. A had in company 50l for 4 months, and B 60l for 5 months: at the end of which they find 24l gained: how muſt it be divided between them?

Anſ. A muſt have 9l 12s, and B 14l 8s.

2. A ſhip's company take a prize of 1000l, which they agree to divide among them according to their pay and the time they have been on board: now the officers and midſhipmen have been on board 6 months, and the ſailors 3 months; the officers have 40s a month, the midſhipmen 30s, and the ſailors 22s a month; moreover there are 4 officers, 12 midſhipmen, and 110 ſailors: what will each man's ſhare be?

Anſ. each officer muſt have 23l 2s 5d 0$\frac{92}{173}$q.
- midſhip. - 17 6 9 3$\frac{69}{173}$
- ſeaman - 6 7 2 0$\frac{8}{173}$

3. A, B, and C have a paſture in common, for which they pay 30l per annum; into which A put 7 cows for 3 months, B 9 cows for 5 months, and C 4 cows for 12 months; what muſt each pay of the rent?

Anſ. A muſt pay 5l 10s 6d 1$\frac{5}{19}$q.
B - 11 16 10 0$\frac{8}{19}$
C - 12 12 7 2$\frac{6}{19}$

4. X, Y, and Z made a joint-ſtock for 12 months; X at firſt put in 20l, and 4 months after 20l more; Y put in at firſt 30l, at the end of 3 months he put in 20l more, and 2 months after he put in 40l more; Z put in at firſt 60l, and 5 months after he put in 10l more, 1 month after which he took out 30l; during the 12 months they gained 50l; how much of it muſt each have?

Anſ. X muſt have 10l 18s 6d 3$\frac{40}{81}$q.
Y - 22 8 1 0$\frac{12}{81}$
Z - 16 13 4 0

BARTER

When the times are equal, the ſhares of the gain or loſs are evidently as the ſtocks, as in ſingle fellowſhip; and when the ſtocks are equal, the ſhares are as the times, wherefore when neither are equal, the ſhares muſt be as their product.

BARTER.

BARTERING is the exchanging of commodities; and as neither party is ſuppoſed to ſuſtain any loſs, when the commodities exchanged are not of equal value, the defect is ſupplied by money, *&c.*

CASE I.

When the quantity of one commodity is known, with its value, or that of its integer; as alſo the value of the integer or rate of ſelling ſome other commodity to be given for it, to find the quantity of this; or having the quantity of the latter given, to find the rate of ſelling it.

If the amount of the given quantity be unknown, calculate it in the ſhorteſt manner you can, from the given value of its integer; then find how much of the other quantity this amount will purchaſe, at the given rate of ſelling it; or if the quantity be given, from thence find the rate of ſelling it.

CASE II.

If the quantities of both commodities, with the rate of ſelling them, be given; to find what quantity of ſome other commodity or money muſt be given in caſe of an inequality of the amount of the firſt commodities.

Calculate the amount of each of the two given commodities; then their difference is the money, or amount of the third commodity to be advanced; whoſe quantity, from thence and its rate, is eaſily found.

CASE III.

When, in bartering, one commodity is rated above the ready-money price; to find the quantity and bartering price of the other commodity.

Say, As the ready-money price of the one is to its bartering price, ſo is that of the other to its barter price; then the quantity of the latter commodity may be found either from the ready-money or bartering prices.

Note. Theſe are the moſt general caſes in barter, and ſuch queſtions as are not contained in them, are eaſily reſolved from a little conſideration of their nature.

EXAMPLES.

1. How much tobacco at 1l 16s per cwt, muſt be given for 3 pipes of wine at 28l 10s per pipe? Anſ. 47c. 2qr.

2. How much cloth at 14s 6d per yard, muſt be given for 3 cwt 3 qr of ſugar, at 3l 4s per cwt.
Anſ. 16 yds $2\frac{6}{29}$qr.

3. What weight of hops, at 1l 12s per cwt, muſt be given for 14 cwt 1 qr 18lb of cheeſe, at 1l 6s per cwt?
Anſ. 11 c 2 qr $23\frac{3}{8}$lb,

4. If 24 yards of cloth be given ſor 5 cwt 1 qr of tobacco at 1l 18s per cwt, what is the cloth rated at per yard?
Anſ. 8s $3\frac{3}{4}$d.

5. A and B would barter: A hath 40 yards of cloth at 7s and 4d per yard, B hath $28\frac{1}{2}$lb of tea, at 11s 6d per lb: whether muſt pay balance, and how much?
Anſ. A muſt pay 1l 14s 5d.

6. C and D would barter: C has 53 quarters 5 buſhels of corn, at 1l 10s per quarter; for which D would give 13 cwt 16lb of ſugar, at 4l 12s per cwt, and the balance in raiſins, at $6\frac{1}{2}$d per lb: how many lb of raiſins muſt be given?
Anſ. $73\frac{67}{91}$lb.

7. E and F barter: E gives to F 90 gallons of brandy, at 7s 8d per gallon; for which F gives to E 10 guineas in money, and 500lb of cotton; what is it valued at per lb?
Anſ. 11d $2\frac{2}{25}$q.

8. G and H bartered: G had 13 cwt 5lb of ſugar, worth 1l 15s per cwt, but bartered it with H at 2l 4s per cwt, for wine worth 4s 8d per gallon; what was the barter price of the wine, and how much of it was given for the ſugar?
Anſ. 5s $10\frac{2}{5}$d per gal, and $97\frac{187}{224}$ gal equal the ſugar.

9. K and L barter: K has woollen cloth worth 8s per yard, which he barters at 9s 3d, with L, for linen cloth, at 3s per yard, which is worth only 2s 7d per yard: whether has the advantage in barter, and how much linen does L give K for 70 yards of woollen? - Anſ. $215\frac{5}{6}$yds of linen; and L has the advantage, his proportional barter price being only 2s 11d $3\frac{3}{8}$q.

LOSS AND GAIN.

QUESTIONS in this rule are ſuch whoſe ſolutions determine the *loſs* or *gain* upon commodities; of which queſtions there is a great variety; but they may be all eaſily ſolved from a little conſideration and the following proportion, *viz.* That the *gains* or *loſſes* are in proportion as the *quantities* of goods, *&c.*

EXAMPLES.

1. Bought 5 c 3 qr 14lb of cheeſe, at 1l 12s per cwt, and ſold it again for 2l 0s 8d per cwt: what was the gain upon the whole? - - Anſ. 2l 10s 11d.

2. If 5 c 3 qr 14lb be bought for 9l 8s, and ſold for 11l 18s 11d, what is the rate of gain per cwt? Anſ. 8s 8d.

3. If 8 c 18lb be bought for 45l: at what rate per lb ſhall I ſell it, to gain 10l upon the whole?

Anſ. 1s 2d $1\frac{351}{457}$q.

4. If 8 c 18 lb coſt 45l, at what rate per lb muſt it be ſold, that the loſs upon the whole may be 10l? Anſ. $9\frac{87}{437}$d.

5. Bought hops at 4l 16s per cwt; at what rate per cwt muſt I ſell them, to gain 15l per cent?

Anſ, 5l 10s 4d $3\frac{1}{5}$q.

6. Bought hops at 4l 16s per cwt; at what rate per cwt muſt I ſell them, to loſe 15l per cent? Anſ. 4l 1s $7\frac{1}{5}$d.

7* If, when I ſell cloth at 7s per yard, I gain 10l per cent; what will be the gain per cent, when it is ſold for 8s 6d per yard? - - Anſ. 33l 11s $5\frac{1}{7}$d.

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* Queſtions of this ſort are ſeldom rightly underſtood, or ſolved. Thus the queſtion beginning at the 7th line of page 33 of the 4th edition of Webſter's arithmetick is wrong, the true anſwer being 15l. and not 10l. And in the ſame manner has Stonehouſe falſely ſolved the ſecond example in page 89 of the 3d edition of his arithmetick, the anſwer to which queſtion ſhould be 23l 12s 6d, and not 8l 12 6d. Alſo in a manner ſimilar to theſe has Dilworth falſely calculated his 7th example in loſs and gain, making the anſwer 2l 16 3d, inſtead of 3l 1s $9\frac{3}{4}$d, though this queſtion has Lowe copied into his book of arithmetic with the falſe anſwer; as he has done ſeveral others from different authors, whereof one is from Malcolm, who brought out his anſwer wrong, not by a falſe method of ſolution, but by ſome wrong figures ſlipping from his pen in the proceſs, or in the propoſition. Hill has alſo run into the ſame miſtake—The error conſiſts in making the gain or loſs of 100l, the 3d term of the ſtating, inſtead of the amount of 100l. For the ſtating ſhould be thus, As 7s : 8s 6d :: 110l : 133l 11s $5\frac{1}{7}$d from which taking away the 100l there remains the anſwer.

8. If, when I ſell cloth at 7s a yard, I gain 10l per cent; what is the gain or loſs per cent, when it is ſold at 6s a yd? Anſ. 5l 14s $3\frac{3}{7}$d loſs.

9. If, when I ſell ſugar at 8s 6d a ſtone, I loſe 5l per cent; what do I gain or loſe per cent, when I ſell it at 9s a ſtone? - - Anſ. 11s $0\frac{3}{17}$d gain.

10. Bought for 17s 8d and ſold for 18s 4d, what was the gain per cent? - Anſ. 3l 15s 5d $2\frac{34}{53}$q.

11. Bought 12 yds of cloth for 5l 9s, and ſold them again at 9s 6d a yard: what was the gain or loſs per cent? Anſ. 4l 11s 8d $3\frac{73}{109}$q. gain.

12. At $1\frac{1}{2}$d per ſhilling profit, how much per cent? Anſ. 12l 10s.

13. At 3s 6d to the pound profit, how much per cent? Anſ. 17l 10s.

14. Having ſold 12 yards of cloth for 5l 14s, and thereby gained 8l per cent; what was the prime coſt of a yard? Anſ. 8s 9d $2\frac{2}{9}$q.

EXCHANGE.

BY exchange is meant the bartering or exchanging of the money of one place for that of another; and, like the bartering of wares, it commonly conſiſts in finding what quantity of the money of one place will be equal to a given ſum of another, according to a given courſe of exchange.

By *courſe* of exchange is meant the variable ſum of the money of one place which is propoſed to be given for a conſtant piece or ſum of that of another, to ſerve for the preſent, as a rate or proportion by which to exchange other ſums; and it is ſometimes above and ſometimes below the *par*.

By the *par* of exchange is meant an intrinſic equality between two pieces or ſums of money, one of which is the conſtant piece or ſum to which the courſe is compared.

The money in the banks of foreign places is finer or purer than that which is current in them; and the difference between any ſum, as valued in the one, and its value in the other, is called *agio*.

Note. It is by comparing the bank money with ours that the par is aſcertained. Alſo the exchange is always ſuppoſed to be made in bank money; and if there be a neceſſity for taking currency in caſe a defect of the bank to anſwer the bills, the more of it muſt be received, and that in proportion to the agio.

I. *With* IRELAND, AMERICA, *and the* WEST-INDIES.

Accounts are kept in Ireland, America, and the Weſt-Indies, in pounds, ſhillings and pence, as in England; and the exchange *per cent* ſterling; the *par* being 108l 6s 8d Iriſh per 100l ſterling, or 1l 1s 8d per pound: alſo 5l ſterling is accounted worth 7l of the currency of the Weſt-indies, becauſe of the great plenty of foreign coins there.

EXAMPLES.

1. London remits to Dublin, 375l 15s: what muſt be received there, exchange at 110 per cent? Anſ. 413l 6s 6d.

2. Dublin remits to London 413l 6s 6d: what muſt be received there, exchange at 110 per cent?

Anſ. 375l 15s.

3. London remits to Jamaica for 212l 12s 6d ſterling: what muſt be received for it, exchange at 135 per cent?

Anſ. 287l 10½d.

4. Jamaica remits to London for 287 10½d currency: what muſt be received for it, exchange at 135 per cent?

Anſ. 212l 12s 6d.

II. *With* HOLLAND, FLANDERS, *and* GERMANY.

In theſe places accounts are kept ſometimes in pounds, ſhillings and pence, as in England; and ſometimes in guilders, ſtivers and pennings. The money of Holland and Flanders is diſtinguiſhed by the name *flemiſh*, and they exchange by the pound ſterling, the par being 33s 4d flemiſh per pound ſterling.

Note.
16 pennings make 1 ſtiver.
20 ſtivers or 40 pence—1 guilder or florin.
8 pennings—1 grote or penny.
12 grotes or pence—1 ſkilling.
20 ſkillings—1 pound.

And in Germany
12 pennings—1 ſhilling lubs.
16 lubiſh ſhilling—1 mark.
6 pennings—1 grot flem.
6 lubiſh ſhill.—1 ſkill. flem.
7½ marks lubs—1 pound flem.

EXAMPLES.

1. To how much flemiſh will 700l ſterling amount, exchange at 34s flem. per l ſterling? - Anſ. 1190l.

2. To how much ſterling will 1190l flemiſh amount, exchange at 34s per l ſterling? - Anſ. 700l.

3. How much flemiſh muſt be given for 314l 5s ſterling, exchange at 33s 8d flem. per l ſter? Anſ. 528l 19s 9d.

4. How much ſterling muſt be given for 528l 19s 9d flemiſh, exchange at 33s 8d per l ſter? Anſ. 314l 5s.

5. How many guilders may I have for 173l 14s 2d ſterling, exchange at 35s $3\frac{1}{2}$d per l ſterling?
Anſ 1839 gu 2 ſt $11\frac{5}{6}$ pen.

6. How much ſterling muſt I have for 2714 guil 15 ſt, exchange at 35s 6d flemiſh per l ſterling?
Anſ. 254l 18s 1d $1\frac{61}{71}$q.

7. What quantity of flemiſh currency muſt I have for 290l 11s 10d ſterling, exchange at 33s 10d flem. per l ſterling, and agio at $4\frac{1}{2}$ per cent? Anſ. 513l 14s 1d $1\frac{917}{3000}$q.

8. How much ſterling muſt I receive for 805l 15s flemiſh currency, the agio being 4 per cent, and exchange 34s 6d flem. per l ſterling? - - Anſ. 449l 2s 8d $2\frac{170}{299}$q.

9. To how much ſterling will 7310 marks 8 ſh 9 ph amount, exchange at 36s 4d flem. per l ſterling?
Anſ. 536l 11s $3\frac{81}{109}$q.

10. How many marks muſt be received for 536l ſter. exchange at 36s 4d flem per l ſter? Anſ. 7303 marks.

III. *With* FRANCE.

In France, accounts are kept in livres, ſols and deniers; exchange being made by the French crown, the par of which is 2s 6d ſterling, or 2s $5\frac{1}{4}$d more nearly.

Note, 12 deniers—a ſol or ſou, value 0 $0\frac{1}{2}$
20 ſols—a livre - - 0 $9\frac{1}{4}$
3 livres—1 crown or ecu 2 $5\frac{1}{4}$

EXAMPLES.

1. How many livres &c. will 121l 18s 6d amount to, exchange at $32\frac{7}{8}$d per ecu? - Anſ. 2670 li 5 ſol 11d.

2. To how much ſterling will 3956 livres amount, exchange at 31d per ecu? - Anſ. 170l 6s $6\frac{2}{3}$d.

3. How many French Crowns may I have for 102l 13s $11\frac{1}{2}$d ſterling, exchange at $31\frac{3}{8}$ per crown?
Anſ. 785 c 34 ſols.

4. To how much ſter. will 1978 cr 25 ſols amount, exchange at $31\frac{5}{8}$ per crown? - Anſ. 260l 13s $11\frac{3}{6}$d.

IV. *With* SPAIN, *&c.*

In Spain they keep their accounts in piaſtres, rials and mervadies; reckoning 372 mervadies to a rial, and 8 rials to a piaſtre, by which they exchange, and its par is 4s 6d ſterling.

Note. In Genoa and Leghorn they keep their accouuts in livres, ſols, and deniers, as in France, but exchange by the piaſtre, as in Spain, which in Genoa is accounted 5 livres, and at Leghorn 6. At Venice too, accounts are by ſome kept in the ſame manner, and by others in ducats and groſs, reckoning 24 groſs to a ducat, upon which they exchange, and its par is accounted 4s 4d ſterling.

EXAMPLES.

1. How many piaſtres, *&c* ſhall I receive in Spain for 510l ſterling, exchange at 50d ſterling per piaſtre? Anſ. 2448 piaſtres.

2. Spain draws upon London for 2448 piaſtres, exchange at 50d per piaſtre; how much ſterling will the draught amount to? - - - Anſ. 510l.

3. How many livres *&c* muſt be given at Genoa for 175l 15s ſterling, exchange at 52d ſter. per piaſtre? Anſ. 4055 liv 15 ſol $4\frac{8}{13}$ dens.

4. Genoa draws upon London for 3000 livres: how much ſterling will ſatisfy this draught, exchange at $50\frac{1}{2}$d per piaſtre? - - - Anſ. 126l 5s.

5. How many livres *&c* muſt be received at Leghorn for 705l 16s 4d ſterling, exchange at $51\frac{1}{2}$d ſter. per piaſtre? Anſ. 19735 liv 9 ſol $1\frac{53}{103}$ den.

6. Leghorn draws upon London for 12000 liv 14 ſol, exchange at 50d ſterling per piaſtre: how much muſt be paid at London for this draught? Anſ. 416l 13s 9d $3\frac{1}{3}$q.

7. How many ducats at Venice will a draught of 427l ſterling amount to, exchange at 49d ſterling per ducat? Anſ. 2091 duc $10\frac{2}{7}$ gro.

8. Venice draws upon London for 2091 duc 10 gro, exchange at 49d ſter. per ducat: to how much ſterling does it amount? - - Anſ. 426l 19s 11d $1\frac{2}{3}$q.

V. *With* PORTUGAL.

In Portugal accounts are kept in milreas and reas, reckoning 1000 reas to a milrea, as its name imports; and they exchange by the milrea, the par of which is about 6s $8\frac{1}{2}$d or 6s 9d ſterling.

EXAMPLES.

1. To how many milreas will 715l amount, exchange at 5s 8d per milrea? - Anſ. 2523 mil 529$\frac{7}{17}$ reas.

2. To how many l &c will a draught of 2523 mil 528 reas amount, exchange at 5s 8d per milrea?
Anſ. 714l 19s 11d 3$\frac{111}{125}$q.

3. How many milreas muſt be given for 213l 7s 10d, exchange at 5s 9½d per milrea?
Anſ. 736 milr. 892$\frac{12}{139}$ reas.

4. To how much ſterling will 736 milreas amount, exchange at 5s 9½d per milrea? - Anſ. 213l 2s 8d.

ARBITRATION OF EXCHANGES.

AS the courſe or rate of exchange between one nation and another, is almoſt continually varying, either by riſing or falling, from the variations in the circumſtances and balance of trade: ſo the deſign of arbitration is to remit or draw upon foreign places in ſuch a manner, as ſhall turn out the moſt profitable.

Arbitration is generally divided into two parts, ſimple and compound.

I. SIMPLE ARBITRATION.

In ſimple arbitration, the exchanges among three places only are concerned. The *par of arbitration*, or *arbitrated price*, is ſuch a rate of exchange between two places, as ſhall be in proportion with the rates aſſigned between each of them and a third place. After this par of arbitration is computed, by comparing it with the preſent courſe of exchange, a perſon can judge which way to remit or draw to the moſt advantage, and determine what the advantage ſhall be.

EXAMPLES.

1. If the exchange between London and Amſterdam be 33s 9d per l ſterling, and the exchange between London and Paris be 32d per crown; required the par of arbitration between Amſterdam and Paris. Anſ. 54d flem. per crown.

2. If the exchange between Amſterdam and Paris be 54d per crown, and between Amſterdam and London 33s 9d per l ſterling; required the arbitrated price between Paris and London. - - Anſ. 32d per crown.

3. If the exchange from London to Paris be 32d per crown, and to Amſterdam 405d per l ſterling; and if, by advice from Holland or France, the courſe of exchange between Amſterdam and Paris be fallen to 52d per crown; what may be gained per cent, by London drawing on the one place and remitting to the other.

Anſ. by drawing on Paris and remitting to Amſterdam may be gained 3l 16s $11\frac{1}{13}$d per cent.

4. London is indebted to Peterſburgh 5000 rubles: now the exchange between Peterſburgh and England is at 50d per ruble, between Peterſburgh and Holland at 90d per ruble, and between Holland and England at 36s 4d. Which will be the more advantageous method for London to be drawn upon? Anſ. London may gain 9l 11s $1\frac{1}{2}$d by making payment by way of Holland.

5. London was ordered to remit 500 ducats to Venice, at 50d per ducat, and to draw upon Spain for the value, at 40d per piaſtre; but when the order came to hand, bills on Venice were at $52\frac{1}{2}$d. Now if London can draw upon Spain at $42\frac{1}{2}$d, whether will it gain or loſe and how much?

Anſ. $7\frac{6}{17}$ piaſtres loſs.

6. London was ordered to remit 800 crowns to Paris, at $31\frac{3}{8}$d per crown, and to draw upon Amſterdam for the value, at 36s 9d per l; but when the order came up, bills on Paris were at $31\frac{5}{8}$d. What muſt be the rate of exchange with Amſterdam to compenſate the advance on the remittance? - - - Anſ. 36s $5\frac{130}{253}$d.

7. A merchant in London had 6000 guilders in the bank at Amſterdam, and was offered 22d ſterling a piece for them; but not liking the offer, he endorſes a bill for the whole to his factor at Paris; who ſoon brought the money to France, by exchanging at 55d flemiſh per crown; he allows the factor $\frac{1}{2}$ per cent commiſſion for his trouble, and then draws upon him for the whole, exchange at 32d per crown. How much was this better than the offer of 22d per guilder?

Anſ. 28l 18s $2\frac{2}{11}$d.

II. COMPOUND ARBITRATION.

Compound arbitration reſpects the caſes in which the exchanges between three, four, or more places are concerned.

A perſon who knows at what rate he can draw or remit directly, and alſo hath advice of the courſe of exchange in foreign places, may trace out a path for circulating his money, through more or fewer of ſuch places, and alſo in ſuch order, as to make a benefit of his ſkill and credit: and herein lies the great art of ſuch negociations.

But to determine in what order, and through how many places to circulate a bill, no general rule can be given, as it depends entirely upon a perſon's judgment, and a cloſe attention to the reſults of former caſes of the like kind. The directions neceſſary for determining whether a direct or an aſſigned circular draft ſhall be preferable, are contained in the following

RULES.

1. Diſtinguiſh the given rates or prices in the circular courſe, into antecedents and conſequents; and place the antecedents in one column, and the conſequents in another, on the right, fronting one another, by way of equation. And in this diſtribution into antecedents and conſequents, each conſequent muſt be of the ſame kind with the next antecedent, and the firſt antecedent of the ſame kind with the laſt conſequent, which muſt be the ſum whoſe value in exchange is required.

2. Multiply the antecedents continually for a diviſor, and the conſequents continually for a dividend; and the quotient of the products will be the value of the ſum required by ſuch exchange.

3. Then compute its value by the direct exchange, or by any other circular exchange, and by comparing the values together you will perceive the moſt advantageous method.

EXAMPLES.

1. If London would remit 1000l ſterling to Spain, the direct exchange being $42\frac{1}{2}$d per piaſtre of 272 mervadies; it is required whether will be more profitable, the direct

remittance, or by remitting firſt to Holland, at 35s per l; thence to France, at 58d per crown; thence to Venice, at 100 crowns per 60 ducats; and thence to Spain, at 360 mervadies per ducat.

Antecedents.		Conſequents.
1l ſterling	=	35s or 420d flemiſh
58d flemiſh	=	1 crown
100 crowns	=	60 ducats
1 ducat	=	360 mervadies
272 mervadies	=	1 piaſtre
How many piaſtres	=	1000l ſterling

Then $\frac{420 \times 60 \times 360 \times 1000}{58 \times 100 \times 272} = \frac{210 \times 30 \times 45 \times 10}{29 \times 17}$

$= \frac{2835000}{493} = 5750\frac{250}{493}$ piaſtres = the value of 1000l by the circular exchange.

But $42\frac{1}{2}$d : 1 piaſtre :: 1000l or 240000d :

$\frac{480000}{85} = \frac{96000}{17} = 5647\frac{1}{17}$ piaſtres, the value by the direct exchange.

So that the circular exchange is the more advantageous, and it produces $103\frac{13}{29}$ piaſtres more than the other.

2. A banker at Amſterdam remits to London 400l flemiſh, thus; viz, firſt to France at 56d per crown; thence to Venice at 100 crowns per 60 ducats; thence to Hamburgh at 100d flemiſh per ducat; thence to Liſbon at 50d per cruſade of 400 reas; and laſtly from Liſbon to London at 64d ſterling per milrea. How much ſterling money will the remittance amount to; and how much will be gained or ſaved, ſuppoſing the direct exchange from Holland to London at 36s 10d per l ſterling?

Anſ. 2l 4s $8\frac{248}{1547}$d gained.

3. A merchant at London has credit for 680 piaſtres at Leghorn, for which he can draw directly at 50d per piaſtre; but chuſing to try the circular way, they are by his order remitted, firſt to Venice at 94 piaſtres per 100 ducats; thence to Cadiz at 320 mervadies per ducat; thence to Liſbon at 630 reas per piaſtre of 272 mervadies; to Amſterdam at 50d per cruſade of 400 reas; thence to Paris at 56d per crown: and thence to London at $31\frac{1}{3}$d per crown:

How much is the circular remittance better than the direct draft, reckoning $\frac{1}{2}$ per cent for commiſſion?

Anſ. 10l 14s $3\frac{53}{64}$d nearly,

Note. The allowance for commiſſion is made by deducting $\frac{1}{2}$ per cent from each of the conſequents 100, 320, 630, 50, and 1, in the ſtating; the beſt way of doing which, is to deduct the 200th part of each from itſelf, or to diminiſh each in the ratio of 200 to 199.

ALLIGATION.

ALLIGATION is the method of mixing together ſeveral ſimples of different qualities, ſo that the compoſition may be of a middle quality: and it is commonly diſtinguiſhed into two principal caſes, denominated alligation medial, and alligation alternate.

CASE I. ALLIGATION MEDIAL.

Alligation medial is the method of finding the rate of the compound, from having the rates and quantities of the ſeveral ſimples given.

Note. That by the rates are meant the numbers which determine or define the proportions of the quantities of the ſimples and the compound; ſuch as the given prices of their integers, or numbers expreſſing their degrees of fineneſs, or any other numbers proportional to them. And if any one of the ſimples be of little or no value with reſpect to the reſt, its rate is ſuppoſed to be 0; as water mixed with wine, or alloy with gold and ſilver.

RULE.

Multiply each quantity by its rate; then divide the ſum of the products, by the ſum of the quantities, or the whole compoſition; and the quotient will be the rate of the compound required,

EXAMPLES.

1. A compoſition being made of 5 lb of tea at 7s per lb, 9 lb at 8s 6d per lb, and $14\frac{1}{2}$ lb at 5s 10d per lb; what is a lb of it worth? - - Anſ. 6s 10d $2\frac{14}{57}$q.

2. What is a gallon of a compoſition of wine worth, which is made by mixing 4 gallons of 4s 10d per gallon, with 7 gallons at 5s 3d, and $9\frac{3}{4}$ gallons at 5s 8d per gallon?

Anſ. 5s 4d $1\frac{45}{83}$q.

3. Having mixed together 17 gallons of ale at 9d per gallon, 14 at $7\frac{1}{2}$d, 5 at $9\frac{1}{2}$d, and 21 at $4\frac{1}{2}$d; how much per gallon is the mixture worth? - Anſ. $7\frac{1}{57}$d.

4. A mixture being made of 12 buſhels of oats at 1s 4d per buſhel, 9 buſhels of peas at 1s 7d, and 4 buſhels 2 pecks of beans at 1s 2d per buſhel, what will it be worth per buſhel? - - - Anſ. 1s 4d $2\frac{14}{17}$q.

5. A compoſition being made by mixing 8 gallons of wine, worth 5s 9d per gallon, with 7 gallons worth 5s 11d, and 2 gallons of water: what is a gallon of it worth?

Anſ. 5s 1d $2\frac{14}{17}$q.

6. Having melted together 7 oz of gold of 22 caracts fine, $12\frac{1}{2}$ oz of 21 caracts fine, and 17 oz of 19 caracts fine: I would know the fineneſs of the compoſition?

Anſ. $20\frac{19}{73}$ caracts fine.

7. Of what fineneſs is that compoſition, which is made by mixing 3 lb of ſilver of 9 oz fine, with 5 lb 8 oz of 10 oz fine, and 1 lb 10 oz of alloy? - Anſ. $7\frac{61}{63}$ oz fine.

CASE II. ALLIGATION ALTERNATE.

Alligation alternate is the method of finding what quantity of each of the ſimples, whoſe rates are given, will compoſe a mixture of a given rate; ſo that it is the reverſe of allegation medial, and may therefore be proved by it.

RULE.

1. Write the rates of the ſimples in a column under each other.

2. Connect, or link with a continued line, the rate of each ſimple which is leſs than that of the compound, with one or any number of thoſe which are greater than the compound; and each greater rate with one or any number of the leſs.

3. Write the difference between the mixture rate and that of each of the ſimples, oppoſite the rates with which theſe are linked.

4. Then if only one difference ſtand againſt any rate, it will be the quantity belonging to that rate; but if there be ſeveral, their ſum will be the quantity.

Note. It appears from the rule, that many of the queſtions of this caſe will admit of various anſwers each; but from an algebraic proceſs it appear that they will all have infinite varieties of anſwers; nay, if the expreſſion may be allowed, that they will admit of infinite varieties of infinite varieties of anſwers. After one or more anſwers are found by the rule, as many more are found as you pleaſe by increaſing or decreaſing the quantities in any proportion, or by only increaſing or decreaſing any one or more ſingle pairs of yoke-fellows in any proportion, and leaving the other rates as they are; but as that anſwer is commonly deſired which gives the rates in the leaſt integer numbers, and thoſe the neareſt to each other, I have to each of the following queſtions ſet down ſuch anſwers as I found by linking the rates together the moſt poſſible, and then, where no limitation was propoſed, dividing the reſulting quantities by their greateſt common meaſure.

EXAMPLES.

1. How much wine at 6s per gallon, and at 4s per gallon muſt be mixed together, that the compoſition may be worth 5s per gallon?

Anſ. 1 qrt or 1 gal or any one equal quantity of each ſort.

2. How much ſugar at 4d, at 6d, and at 11d per pound, muſt be mixed together, that the compoſition may be worth 7d per pound? - Anſ. 1 lb, or 1 ſtone, or 1 cwt, or any other equal quantity of each ſort.

3. How much corn at 2s 6d, at 3s 8d, at 4s, and at 4s 8d, per buſhel, muſt be mixed together, that the compound may be worth 3s 10d per buſhel?

Anſ. 2 at 2s 6d, 2 at 3s 8d, 3 at 4s, and 3 at 4s 8d.

4. A compoſition whoſe rate may be 7s 6d, being to be made, by mixing together ſimples whoſe rates are 4s, 5s 8d, 6s, 7s 4d, and 8s; how much of each muſt be uſed?

Anſ. an equal quantity of the firſt four ſorts, and 14 times the ſame quantity of the laſt ſort.

5. To mix gold of 19 caracts fine, with gold of 23, of 21, of 18, and of 17 caracts fine, that the compound may be 20 caracts fine: what quantity muſt be taken of each?

Anſ. 2 at 17, 18, 19; and 3 at 21, 23.

6. What are the proportions of the quantities of alloy, and gold of 22 caracts fine, which, when mixed together, will make the compoſition of 20 caracts fine?

Anſ. There muſt be 10 times as much gold as alloy.

Sometimes one or more of the ingredients, and ſometimes the whole compoſition is limited to a certain quantity: which I divide into the three following caſes or limitations.

LIMITATION I.

When the whole compoſition is limited to a certain quantity, and that quantity is not ſound from the method of linking, and taking the differences; then you may augment or diminiſh the quantity of each ingredient, in the ſame proportion as the given quantity is greater or leſs than the total quantity found from the linking, by ſaying, As the total quantity ſo found, is to the given quantity, ſo is the quantity of each ingredient, found by linking, to the required quantity of each.

EXAMPLES.

1. How much wine at 4s, at 5s, at 5s 6d, and at 6s a gallon, muſt be mixed together, to form a compoſition of 18 gallons, worth 5s 4d a gallon?

Anſ. 3 gal. at 4s, and 5s,
and 6 gal. at 5s 6d and 6s.

2. How much gold of 15, of 17, of 18, and of 22 caracts fine, muſt be mixed together, to form a compoſition of 40 ounces, of 20 caracts fine? Anſ. 5 oz of 15, of 17, and of 18; and 25 oz of 22 caracts fine.

N. B. To this caſe belongs the queſtion concerning king Hiero's crown, which the workman had debaſed with ſilver, or copper; and to find what quantity of gold or copper was in it, the famous Archimedes, it is ſaid, made two other crowns, of the ſame weight with the former, the one of gold, and the other of ſilver, or copper; and by putting each into a veſſel full of water, the quantity of water expelled by them determined their ſpecific bulks: from which, and their given weight, it is eaſier to determine the quantities of gold and copper in the crown, by this caſe of alligation, than by an algebraic proceſs.

Suppoſe the weight of each crown to be 10lb, and the water expelled by the copper or ſilver was 92lb, by the gold 52lb, and by the compound crown was 64lb; that is, their ſpecific bulks were as 92, 52, and 64.

Here then the rates of the ſimples are 92 and 52, and of the compound 64; therefore

$$64\left|\begin{array}{l}92\\52\end{array}\right.\left(\begin{array}{l}12\text{ of copper,}\\28\text{ of gold}\end{array}\right.$$

The ſum of theſe is 12 + 28 = 40, which ſhould have been but 10; therefore, by our rule,

$$\text{As } 40 : 10 :: \left\{\begin{array}{l}12 : 3\text{ of copper,}\\28 : 7\text{ of gold.}\end{array}\right.$$

LIMITATION

LIMITATION II.

When one of the ingredients is limited to a certain quantity, and that quantity is not found by the method of linking; you may either augment, or diminiſh the quantities of all the reſt, in the ſame proportion as the given quantity is greater or leſs than the quantity of the limited ſimple found by linking, by ſtating as in the firſt limitation: * Or, you may only augment, or diminiſh, in the above proportion, that part of the quantity of the ingredients with which the limited one is linked, which is the difference of the mixture rate and the rate of the limited ſimple, and add the reſulting quantity to other parts, inſtead of the ſaid difference; keeping the quantities of the other ſimples unaltered.

EXAMPLES.

1. How much wine at 5s, at 5s 6d, and at 6s the gallon, muſt be mixed with 3 gallons at 4s the gallon, that the mixture may be worth 5s 4d a gallon?

Anſ.	3 gal at 5s 6 - - 5s 6d 6 - - 6s	by proportioning all the quantities.
Or,	10 gal at 5s $8\frac{4}{5}$ - 5s 6d $8\frac{4}{5}$ - 6s	by proportioning only the difference of the mixture and limited rates.

2. How much gold of 15, of 17, and of 22 caracts fine, muſt be mixed with 5 ounces of 18 caracts fine, that the compoſition may be 20 caracts fine?

Anſ.	5 oz of 15 caracts fine 5 - 17 - - - 25 - 22 - - -	by proportioning all the quantities.

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* Hence we may obſerve that Mr. Malcolm has inadvertently given a rule in page 569 of his arithmetic, for queſtions of this ſort, when the limited ſimple is only once linked, which will not always give true anſwers; he ſays, "If the ſimple whoſe quantity is limited, is only once linked, we need do no more than raiſe or diminiſh the quantity of that one ſimple with which it is linked, and leave the reſt as they are." Inſtead of which, if he had conſidered that the ſimple with which the limited one is linked, may alſo be linked with ſome one or more of the reſt, I apprehend he would have ſaid, Raiſe or diminiſh that part of the ſimple with which the limited one is linked, which is the difference betwixt the mixture rate and the rate of the limited ſimple.

Or, { 2 oz of 15 caracts fine
2 - 17 - - -
13 - 22 - - - } by proportioning only the difference of the mixture and limited rates.

LIMITATION III.

If more than one of the ſimples be limited, find, by Caſe 1, what will be the rate of a mixture made of the given quantities of the limited ſimples only; then conſider this as the rate of a limited ſimple whoſe quantity is the ſum of the firſt given limited ſimples; from which, and the rates of the limited ſimples, by the ſecond limitation, calculate the quantity of each.

EXAMPLES.

1. How much wine at 5s 6d, and at 6s a gallon, muſt be mixed with 3 gallons at 4s, and 3 gallons at 5s a gallon, that the mixture may be worth 5s 4d a gallon?

Anſ. 6 gal at 5s 6d, and 6 gal at 6s a gallon.

2. How much gold at 15 and 17 caracts fine, muſt be mixed with 5 ounces of 18, and 13 ounces of 22 caracts fine, that the compoſition may be of 20 caracts fine?

Anſ. 2 oz of each ſort.

INVOLUTION.

A POWER is a number produced by multiplying any given number continually by itſelf a certain number of times.

Any number is called the firſt power of itſelf; if it be multiplied by itſelf, the product is called the ſecond power, and ſometimes the ſquare; if this be multiplied by the firſt power again, the product is called the third power, and ſometimes the cube; and if this be multiplied by the firſt power again, the product is called the fourth power; and ſo on; that is, the power is denominated from the number which exceeds the multiplications by 1.

Thus: 3 is the firſt power of 3.
3 × 3 = 9 is the ſecond power of 3.
3 × 3 × 3 = 27 is the third power of 3.
3 × 3 × 3 × 3 = 81 is the fourth power of 3.
&c. &c.

And in this manner may be calculated the following table of powers.

TABLE *of the firſt twelve powers of numbers.*

1ſt power	1	2	3	4	5	6	7	8	9
2d power	1	4	9	16	25	36	49	64	81
3d power	1	8	27	64	125	216	343	512	729
4th power	1	16	81	256	625	1296	2401	4096	6561
5th power	1	32	243	1024	3125	7776	16807	32768	59049
6th power	1	64	729	4096	15625	46656	117649	262144	531441
7th power	1	128	2187	16384	78125	279936	823543	2097152	4782969
8th power	1	256	6561	65536	390625	1679616	5764801	16777216	43046721
9th power	1	512	19683	262144	1953125	10077696	40353607	134217728	387420489
10th power	1	1024	59049	1048576	9765625	60466176	282475249	1073741824	3486784401
11th power	1	2048	177147	4194304	48828125	362797056	1977326743	8589934592	31381059609
12th power	1	4096	531441	16777216	244140625	2176782336	13841287201	68719476736	282429536481

Note. 1. The number which exceeds the multiplications by 1, is called the index, or exponent of the power: ſo the index of the firſt power is 1, that of the ſecond power is 2, and that of the third is 3, &c.

2. Powers are commonly denoted by writing their indices above the firſt power: ſo the ſecond power of 3 may be denoted thus 3^2, the third power thus 3^3, the fourth power thus 3^4, &c. and the 6th power of 503; thus 503^6.

Involution is the finding of powers, to do which, from their definition there evidently comes this

RULE.

Multiply the given number, or firſt power, continually by itſelf, till the number of multiplications be 1 leſs than the index of the power to be found, and the laſt product will be the power required.

Note 1. Whence, becauſe fractions are multiplied by taking the products of their numerators and of their denominators, they will be involved by raiſing each of their terms to the power required. And if a mixt number be propoſed, either reduce it to an improper fraction, or reduce the vulgar fraction to a decimal, and proceed by the rule.

2. The raiſing of powers will be ſometimes ſhortened by working according to this obſervation, viz whatever two or more powers are multiplied together, their product is the power whoſe index is the ſum of the indices of the factors; or if a power be multiplied by itſelf, the product will be the power whoſe index is double of that which is multiplied: ſo if I would find the ſixth power; I might multiply the given number twice by itſelf for the third power, then the third power into itſelf would give the ſixth power; or if I would find the ſeventh power; I might firſt find the third and fourth, and their product will be the ſeventh; or laſtly, if I would find the eighth power, I might firſt find the ſecond, then the ſecond into itſelf would be the fourth, and this into itſelf would be the eighth.

EXAMPLES.

1. What is the ſecond power of 45? - Anſ. 2025.
2. What is the ſquare of 4·16? - Anſ. 17·3056.
3. What is the ſquare of ·027? - Anſ. ·000729
4. What is the third power of 3·5? - Anſ. 42·875.
5. What is the 4th power of 71·8? Anſ. 26576499·4576.
6. What is the 5th power of ·029? Anſ. ·000000020511149.
7. What is the 6th power of 5·03?
Anſ. 16196·005304479729.
8. What is the ſecond power of $\frac{2}{3}$? - Anſ. $\frac{4}{9}$.
9. What is the third power of $\frac{5}{9}$? - Anſ. $\frac{125}{729}$.
10. What is the ſquare of $3\frac{2}{5}$? - Anſ. $\frac{289}{25}$ or 11·56.

EVOLU-

EVOLUTION.

THE root of any given number, or power, is ſuch a number, as being multiplied by itſelf a certain number of times, will produce the power; and it is denominated the firſt, ſecond, third, fourth, &c root, reſpectively, as the number of multiplications made of it to produce the given power is 0, 1, 2, 3, &c; that is, the name of the root is taken from the number which exceeds the multiplications by 1, like the name of the power in involution.

Note. 1. The index of the root, like that of the power in involution, is 1 more than the number of multiplications neceſſary to produce the power or given number.

2. Roots are ſometimes denoted by writing $\sqrt{\ }$ before the power, with the index of the root againſt it: ſo the third root of 50 is $\sqrt[3]{50}$, and the ſecond root of it is $\sqrt{50}$, the index 2 being omitted; which index is always underſtood when a root is named or written without one. But if the power be expreſſed by ſeveral numbers with the ſign + or — &c between them, then a line is drawn from the top of the ſign of the root, or radical ſign, over all the parts of it: ſo the third root of 47 — 15 is $\sqrt[3]{47-15}$. And ſometimes roots are deſigned like powers, with the reciprocal of the index of the root of the given number. So the root of 3 is $3^{\frac{1}{2}}$, the root of 50 is $50^{\frac{1}{2}}$, and the third root of it is $50^{\frac{1}{3}}$, alſo the third root of 47—15 is $\overline{47-15}^{\frac{1}{3}}$. And this method of notation has juſtly prevailed in the modern algebra; becauſe ſuch roots, being conſidered as fractional powers, need no other directions for any operations to be made with them, than thoſe for integral powers.

3. A number is called a complete power of any kind, when its root of the ſame kind can be accurately extracted; but if not the number is called an imperfect power, and its root a ſurd or irrational quantity; ſo 4 is a complete power of the ſecond kind, its root being 2; but an imperfect power of the third kind, its third root being a ſurd quantity.

Evolution is the finding of the roots of numbers, either accurately, or in decimals to any propoſed extent.

The power is firſt to be prepared for extraction, or evolution, by dividing it from the place of units, to the left hand in integers, and to the right in decimal fractions, into periods, containing each as many places of figures as are denominated by the index of the root, if the power contain a complete number of ſuch periods: if it do not, the defect will be either on the right hand, or left, or both; if the defect be on the right hand, it may be ſupplied by annexing ciphers, and after this whole periods of ciphers may be annexed to continue the extraction with, if neceſſary; but if there be a defect on the left, ſuch defective period muſt remain unaltered, and is accounted the firſt period of the given number, juſt the ſame as if it were complete.

Now this diviſion may be conveniently made by making a point over the place of units, and alſo over the laſt figure of every period on both ſides of it; that is, over every ſecond figure if it be the ſecond root, over every third if it be the third root, &c.

Thus, to point this number $21035896\cdot12735$;

for the ſecond root, it will be $2\dot{1}0\dot{3}5\dot{8}9\dot{6}\cdot1\dot{2}7\dot{3}5\dot{0}$;

but for the third root, thus $2\dot{1}03\dot{5}89\dot{6}\cdot12\dot{7}35\dot{0}$;

and for the fourth, thus $210\dot{3}589\dot{6}\cdot127\dot{3}500\dot{0}$.

Note. The root will contain juſt as many places of figures as there are periods or points in the given power; and they will be integers, or decimals reſpectively, as the periods are ſo from which they are found, or to which they correſpond; that is, there will be as many integer or decimal figures in the root, as there are periods of integers or decimals in the given number.

TO EXTRACT THE SQUARE ROOT.

1. Having pointed the given number into periods of two figures each, find, from the table of powers in page 111, or otherwiſe, a ſquare number either equal to, or the next leſs than the firſt period, which ſubtract from it, and ſet the root of the ſquare on the right hand ſide of the given number, after the manner of a quotient in diviſion, for the firſt figure of the root required.

2. To the remainder annex the ſecond period for a dividend; and on the left hand of it write the double of the root already found, after the manner of a diviſor.

3. Conſider what figure, which, if annexed to the diviſor, and the reſult multiplied by it, the product may be equal to, or the next leſs than the dividend, and it will be the next figure of the root.

4. From the dividend ſubtract the product, and to the remainder bring down the next period, for a new dividend

dend: to which as before, find a diviſor by doubling the figures already found in the root; and from theſe find the next figure of the root, as in the laſt article; and continue the operation ſtill in the ſame manner, till all the periods be uſed, or as far as you pleaſe.

Note. When the root is to be extracted to a great number of places, the work may be much abbreviated thus: having proceeded in the extraction after the common method till you have found half the required number of figures in the root, the reſt may be found by dividing the laſt remainder by its correſponding diviſor, annexing a cipher to every dividual, as in diviſion of decimals; or rather, without annexing ciphers, by omitting continually the right-hand figure of the diviſor, after the manner of the third contraction in diviſion of decimals in page 76.

So the operation for the root of 2 to 12 or 13 places, may be thus.

```
              2 ( 1·41421356237 + root
              1
 24     |   100
  4     |    96
 281    |    400
   1    |    281
 2824   |    11900
    4   |    11296
 28282  |     60400
     2  |     56564
 282841 |     383600
      1 |     282841
 2828423 |    10075900
       3 |     8485269
 2828426 )     1590631 (56237 +
               176418
                 6712
                 1055
                  206
                    8
```

EXAMPLES.

1. What is the root of 2025? - - Anſ. 45.
2. What is the root of 17·3056? - - Anſ. 4·16.
3. What is the root of ·000729? - - Anſ. ·027.
4. What is the root of 3? - - Anſ. 1·732050.
5. What is the root of 5? - - Anſ. 2·236068.
6. What is the root of 6? - - Anſ. 2·449489.
7. What is the root of 7? - - Anſ. 2·645751.
8. What is the root of 10? - - Anſ. 3·162278.
9. What is the root of 11? - - Anſ. 3·316625.

RULES *for the ſquare roots of* VULGAR FRACTIONS *and* MIXT NUMBERS.

Firſt prepare all vulgar fractions by reducing them to their leaſt terms, both for this and all other roots. Then

1. Take the root of the numerator and of the denominator for the reſpective terms of the root required. And this is the beſt way if the denominator be a complete power. But if it be not, then

2. Multiply the numerator and denominator together; take the root of the product: this root being made the numerator to the denominator of the given fraction, or made the denominator to the numerator of it, will form the fractional root required.

$$\text{That is, } \sqrt{\frac{a}{b}} = \frac{\sqrt{ab}}{b} = \frac{a}{\sqrt{ab}}.$$

And this rule will ſerve whether the root be finite or infinite.

3. Or reduce the vulgar fraction to a decimal, and extract its root.

4. Mixt numbers may be either reduced to improper fractions, and extracted by the firſt or ſecond rule; or the vulgar fraction may be reduced to a decimal, then joined to the integer, and the root of the whole extracted.

EXAMPLES.

1. What is the root of $\frac{25}{36}$? - - Anſ. $\frac{5}{6}$.
2. What is the root of $\frac{27}{147}$? - - Anſ. $\frac{3}{7}$.
3. What is the root of $\frac{9}{12}$? - - Anſ. 0·866025.
4. What is the root of $\frac{5}{12}$? - - Anſ. 0·645469.
5. What is the root of $17\frac{3}{8}$? - - Anſ. 4·168333.

By means of the ſquare root alſo we readily find the 4th root, or the 8th root, or the 16th root, &c; that is, the root of any power whoſe index is ſome power of the number 2; namely, by extracting ſo often the ſquare root as is denoted by that power of 2; that is, two extractions for the fourth root, three for the 8th root, and ſo on.

```
 . . . . .      . . . . .
 21035·8000  (  145·037237 ( 12·0431407 root.
 1              1
24 | 110       22 | 45
   |  96          | 44
285 | 1435   2404 | 10372
    | 1425        |  9616
29003 | 108000  24083 | 75637
    6 |  87009      6 | 72249
          20991 ( 7237    3388 ( 1407
            687            980
            107             17
             20
```

TO EXTRACT THE CUBE ROOT.

I. *By the Common Rule.*

1. Having divided the given number into periods of three figures each, find the neareſt leſs cube to the firſt period, in the third line of the table of powers in page 111; ſet its root in the quotient, and ſubtract the ſaid cube from the firſt period; to the remainder bring down the ſecond period, and call this the *reſolvend.*

2. To three times the ſquare of the root, juſt found, add three times the root itſelf, ſetting this one place more to the right than the former, and call this ſum the diviſor. Then divide the reſolvend, wanting the laſt figure, by the diviſor, for the next figure of the root, which annex to the former; calling this laſt figure *e*, and the part of the root before found called *a*.

3. Add all together theſe three products, namely, thrice *a* ſquare multiplied by *e*, thrice *a* multiplied by *e* ſquare, and *e* cube, ſetting each of them one place more to the right than the former, and call the ſum the *ſubtrahend*; which muſt not exceed the reſolvend; and if it does, then make the laſt figure *e* leſs, and repeat the operation for finding the ſubtrahend.

4. From the reſolvend take the ſubtrahend, and to the remainder join the next period of the given number for a new reſolvend; to which form a new diviſor from the whole root now found; and from thence another figure of the root, as directed in article 2, &c.

EXAMPLE.

To extract the cube root of 48228·544

$$
\begin{array}{rl|l}
3 \times 3^2 = & 27 & 48\dot{2}28\dot{·}544 \;(\; 36·4 \text{ root.} \\
3 \times 3 = & \underline{09} & \underline{27} \\
\text{Diviſor} & 279 & 21228 \text{ reſolvend} \\
\hline
3 \times 3^2 \times 6 = & 162 & \\
3 \times 3 \times 6^2 = & 324 & \text{add} \\
6^3 = & 216 & \\
\hline
3 \times 36^2 = & 3888 & 19656 \text{ ſubtrahend} \\
3 \times 36 = & \underline{108} & \\
 & 38988 & 1572544 \text{ reſolvend} \\
\hline
3 \times 36^2 \times 4 = & 15552 & \\
3 \times 36 \times 4^2 = & 1728 & \text{add} \\
4^3 = & 64 & \\
\hline
 & 1572544 & \text{ſubtrahend} \\
 & 0000000 & \text{remainder.}
\end{array}
$$

II. *To extract the Cube Root by a ſhort way.*

1. By trials take the neareſt rational cube to the given cube or number, whether it be greater or leſs, and call it the aſſumed cube.

2. Then the ſum of the given number and double the aſſumed cube, will be to the ſum of the aſſumed cube and double the given number, as the root of the aſſumed cube, is to the root required, nearly. Or as the firſt ſum is to the difference of the given and aſſumed cube, ſo is the aſſumed root, to the difference of the roots nearly.

3. Again, by uſing, in like manner, the cube of the root laſt found as a new aſſumed cube, another root will be got ſtill nearer. And ſo on as far as we pleaſe; uſing always the cube of the laſt found root, for the aſſumed cube.

EXAMPLE.

To find the Cube Root of 21034·8.

Here we ſoon find that the root lies between 20 and 30, and then between 27 and 28. Taking therefore 27, its cube is 19683 the aſſumed cube. Then

```
      19683         21035·8
          2               2
     ------       ---------
      39366         42071·6
    21035·8         19683
  ---------       ---------
As  60401·8   :    61754·6 :: 27 : 27·6047
                        27
                ----------
                   4322822
                  1235092
                 ----------
         60401·8)1667374·2( 27·6047 the root nearly,
                  459338
                   36525
                     284
                      42
```

Again for a ſecond operation, the cube of this root is 21035·318645155823, and the proceſs by the latter method will be thus

```
     21035·318645 &c
                2
     ----------------
     42070·637290      21035·8
     21035·8           21035·318645 &c
     ----------------  ---------------
As 63106·43729  :  diff.  ·481355 : : 27·6047 :
                     the dif.       ·000210834
                                  -------------
         conſeq. the root req. is 27·604910834
```

TO EXTRACT ANY ROOT WHATEVER.

Let G be the given power or number, *n* the index of the power, A the aſſumed power, *r* its root, R the required root of G.

Then as the ſum of $n+1$ times A and $n-1$ times G, is to the ſum of $n+1$ times G and $n-1$ times A, ſo is the aſſumed root *r*, to the required root of R.

Or, as half the ſaid ſum of $n+1$ times A and $n-1$ times G, is to the difference between the given and aſſumed powers, ſo is the aſſumed root *r*, to the difference between the true and aſſumed roots: which difference, added or ſubtracted, gives the true root nearly.

That is, $\overline{n+1}\,.\,A+\overline{n-1}\,.\,G : \overline{n+1}\,.\,G+\overline{n-1}\,.\,A :: r : R.$

Or, $\overline{n+1}\,.\,\frac{1}{2}A+\overline{n-1}\,.\,\frac{1}{2}G : A \backsim G :: r : R \backsim r.$

And the operation may be repeated as often as we pleaſe, by uſing always the laſt found root for the aſſumed root, and its *n*th power for the aſſumed power A.

Ex. To extract the 5th root of 21035·8.

Here it appears that the 5th root is between 7·3 and 7·4. Taking 7·3, its 5th power is 20730·71593. Hence then we have

G =

$G = 21035{\cdot}8$; $r = 7{\cdot}3$; $n = 5$; $\overline{\tfrac{1}{2}n+1} = 3$; $\tfrac{1}{2}\,\overline{n-1} = 2$.

$A = 20730{\cdot}716$

$G - A = 305{\cdot}084$

$A = 20730{\cdot}716$ $\quad G = 21035{\cdot}8$

$\qquad\qquad 3 \qquad\qquad\qquad 2$

$3A = 62192{\cdot}148 \qquad 42071{\cdot}6$

$2G = 42071{\cdot}6$

As $104263{\cdot}7 : 305{\cdot}084 :: 7{\cdot}3 : {\cdot}0213605$

$7{\cdot}3$

915252

2135588

$104263{\cdot}7\,)\,2227{\cdot}1132\,(\,0213605$ the diff.

14184 $\quad 7{\cdot}3 = r$ add

3758 $\quad 7{\cdot}321360 =$ R the root true

630 $\quad$ to the laſt figure.

5

OTHER EXAMPLES.

1. What is the 3d root of 2? -	Anſ. 1·259921.
2. What is the 4th root of 2? -	Anſ. 1·189207.
3. What is the 4th root of 97·41? -	Anſ. 3·1415999.
4. What is the 5th root of 2? -	Anſ. 1·148699.
5. What is the 6th root of 21035·8?	Anſ. 5·254037.
6. What is the 6th root of 2? -	Anſ. 1·122462.
7. What is the 7th root of 21035·8?	Anſ. 4·145392.
8. What is the 7th root of 2? -	Anſ. 1·104089.
9. What is the 8th root of 21035·8?	Anſ. 3·470323.
10. What is the 8th root of 2? -	Anſ. 1·090508.
11. What is the 9th root of 21035·8?	Anſ. 3·022239.
12. What is the 9th root of 2?	Anſ. 1·080059.

GENERAL RULES *for extracting any root out of a* Vulgar Fraction, *or* Mixt Number.

1. If the given fraction have a finite root of the kind required, it is beſt to extract the root out of the numerator and denominator, for the terms of the root required.

2. But if the fraction be not a complete power, it may be thrown into a decimal, and then extracted. Or,

3. Take either of the terms of the given fraction for the correſponding term of the root; and for the other term of the root, extract the required root of the product, ariſing from the multiplication of ſuch a power of the firſt aſſigned term of the root whoſe index is leſs by 1 than that of the given power, by the other term of the given number. This rule will do when the root is either finite or infinite. That is, for any root n in general.

$$\sqrt[n]{\frac{a}{b}} = \frac{\sqrt[n]{a}}{\sqrt[u]{b}} = \frac{\sqrt[n]{ab^{n-1}}}{b} = \frac{a}{\sqrt[n]{ba^{n-1}}}$$

4. Mixt numbers may be reduced either to improper fractions or decimals, and then extracted.

EXAMPLES.

1. What is the cube root of $\frac{8}{27}$? - - Anſ. $\frac{2}{3}$.
2. What is the fourth root of $\frac{80}{405}$? - Anſ. $\frac{2}{3}$.
3. What is the cube root of $\frac{1}{2}$? - Anſ. ·7937005.
4. What is the cube root of $2\frac{10}{27}$? - Anſ. $\frac{4}{3}$ or $1\frac{1}{3}$.
5. What is the third root of $7\frac{1}{5}$? - Anſ. 1·930979.

OF PROPORTION IN GENERAL.

NUMBERS are compared together to diſcover the relations they have to each other.

There muſt be two numbers to form a compariſon: the number which is compared, being written firſt, is called the antecedent; and that to which it is compared, the conſequent.

Numbers are compared to each other two different ways: the one compariſon conſiders the difference of the two numbers, and is called arithmetical relation, the difference being ſometimes named the arithmetical ratio; and the other conſiders their quotient, which is termed geometrical relation, and the quotient the geometrical ratio. So of theſe numbers 6 and 3, the difference or arithmetical ratio, is 6—3 or 3; and the geometrical ratio is $\frac{6}{3}$ or 2.

Note. Ratios are here always conſidered as the reſult of the greater term of compariſon diminiſhed, or divided, by the leſs, not regarding whether of them be the antecedent.

If two or more couplets of numbers have equal ratios, or differences, the equality is named proportion; and their terms, ſimilarly poſited, that is, either all the greater, or all the leſs taken as antecedents, and the reſt as conſequents, are called proportionals. So the two couplets 2, 4, and 6, 8, taken thus, 2, 4, 6, 8, or thus, 4, 2, 8, 6, are arithmetical proportionals, and the two couplets 2, 4, and 8, 16, taken thus, 2, 4, 8, 16, or thus, 4, 2, 16, 8, are geometrical proportionals.

To denote numbers as being geometrically proportional, the couplets are ſeparated by a double colon, and a colon is written between the terms of each couplet: we may alſo denote arithmetical proportionals by ſeparating the couplets with a double colon, and writing a colon turned horizontally between the terms of each couplet. So the above arithmeticals may be written thus, 2 .. 4 :: 6 .. 8, and 4 .. 2 :: 8 .. 6; where the firſt antecedent is leſs or greater than its conſequent, by juſt as much as the ſecond antecedent is leſs or greater than its conſequent: and the geometricals thus, 2 : 4 :: 8 : 16, and 4 : 2 :: 16 : 8; where the firſt antecedent is contained in or contains its conſequent, juſt as often as the ſecond is contained in or contains its conſequent. It is common to read the geometricals 4 : 2 :: 16 : 8, thus, 4 is to 2 as 16 to 8.

Proportion is diſtinguiſhed into continued and diſcontinued.

If, of ſeveral couplets of proportionals placed in a ſeries, the difference or ratio of each conſequent and the antecedent of the next following couplet, be the ſame as the common difference or ratio of the couplets, the proportion is ſaid to be continued, and the numbers themſelves a ſeries of continued proportionals, or an arithmetical or geometrical progreſſion. So 2, 4, 6, 8, form an arithmetical progreſſion; for $4 - 2 = 6 - 4 = 8 - 6 = 2$; and 2, 4, 8, 16, a geometrical progreſſion; for $\frac{4}{2} = \frac{8}{4} = \frac{16}{8} = 2$.

But if the difference or ratio of the conſequent of one couplet and the antecedent of the next couplet, be not the ſame as the common difference or ratio of the couplets, the proportion is ſaid to be diſcontinued. So 4, 2, 8, 6 are in diſcontinued arithmetical proportion; for $4 - 2 = 8 - 6 = 2$, but $8 - 2 = 6$; alſo 4, 2, 16, 8 are in diſcontinued geometrical proportion; for $\frac{4}{2} = \frac{16}{8} = 2$, but $\frac{16}{2} = 8$.

If the ſucceeding terms of a progreſſion exceed each other, it is called an aſcending progreſſion or ſeries; if the contrary, a deſcending ſeries.

So { 0, 1, 2, 3, 4, &c, is an aſcending arithmetical ſeries,
1, 2, 4, 8, 16, &c, is an aſcending geometrical ſeries,
and { 4, 3, 2, 1, 0, &c, is a deſcending arithmetical ſeries,
16, 8, 4, 2, 1, &c, is a deſcending geometrical ſeries.

The firſt and laſt terms of a progreſſion are called the extremes; and the other terms, the means.

ARITHMETICAL PROGRESSION.

AN arithmetical progreſſion is a ſeries, of which the ſucceeding terms are either all greater, or all leſs than their adjacent preceding terms, by the ſame number or difference.

Note. The fundamental property of an arithmetical progreſſion from which almoſt all its other properties are deducible, and which evidently follows from its conſtruction, is, that the ſum of any two of its terms, is equal to the ſum of any other two terms, taken at an equal diſtance, but on contrary ſides of the former; or that the double of any one term, is equal to the ſum of any two terms taken at an equal diſtance from it on each ſide. And of any two couplets in diſcontinued arithmetical proportion, the two ſums are equal which are made by adding the antecedent of each to the conſequent of the other.

PROBLEM I.

Give one of the extremes, the common difference, and the number of terms of an arithmetical ſeries; to find

1. The other extreme.

RULE. Multiply the common difference by 1 leſs than the number of terms; then add the product to the leaſt term, and the ſum will be the greateſt, or ſubtract it from the greateſt term, to give the leaſt.

2. The ſum of all the terms of the ſeries.

RULE. Multiply the ſum of the extremes by the number of terms, and half the product will be the ſum of the ſeries.

Thus, if a repreſent the leſs extreme,
z the greater,
d the common difference,
n the number of terms, and
s the ſum of the ſeries;

$$\text{then}\left\{\begin{array}{l} z = a + d \times \overline{n-1}. \\ \\ a = z - d \times \overline{n-1}. \end{array}\right. \qquad \text{and}\left\{\begin{array}{l} s = \dfrac{2a + dn - d}{2} \times n, \\ s = \dfrac{2z - dn + a}{2} \times n. \end{array}\right.$$

EXAMPLES.

1. Given the leaſt term 3, the common difference 2, and the number of terms 9: to find the greateſt term and the ſum of the ſeries?

Anſ. the greateſt term is 19, and the ſum of the ſeries is 99.

2. If the greateſt term be 70, the common difference 3, and the number of terms 21; what is the leaſt term, and the ſum of the ſeries?

Anſ. the leaſt term is 10, and the ſum is 840.

3. A debt can be diſcharged in a year, by paying 1 ſhilling the firſt week, 3 ſhillings the ſecond, and ſo on, always 2 ſhillings more every week? what is the debt, and what will the laſt payment be?

Anſ. the laſt payment will be 5l 3s, and the debt is 135l 4s.

4. One hundred ſtones being diſpoſed on the ground in a ſtraight line, at the diſtance of a yard from each other; how many yards will a perſon travel who ſhall bring them all, one by one, to a baſket placed one yard from the firſt ſtone?

Anſ. 10100 yds, or 5 mls 1300 yds, or nearly $5\frac{3}{4}$ mls.

PROBLEM II.

Given the extremes and the common difference to find

1. The number of terms.

RULE. Divide the difference of the extremes by the common difference, add 1 to the quotient, and the ſum will be the number of terms.

2. The ſum of the ſeries.

Having found the number of terms, the ſum of the ſeries will be had by the ſecond caſe of problem 1.

Thus, uſing the ſame ſymbols as before,

$$n = \frac{z-a}{d} + 1, \text{ and } s = \overline{a+z} \times \frac{z-a+d}{2d}.$$

EXAMPLES.

1. If the extremes be 3 and 19, and the common difference 2; what is the number of terms, and the ſum of the ſeries?

Anſ. The number of terms is 9, and the ſum is 99.

2. If the extremes be 10 and 70, and the common difference 3; what is the number of terms, and the ſum of the ſeries?

Anſ. The number of terms is 21, and the ſum is 840.

3. What debt can be diſcharged, and in what time, ſuppoſing the firſt week the payment be 1s, and the payments every week following to increaſe by 2s, till the laſt payment be 5l 3s? - Anſ. The debt is 135l 4s, and it will be diſcharged in a year or 52 weeks.

PROBLEM III.

Given the extremes and the number of terms, to find

1. The common difference.

RULE. This is found by dividing the difference of the extremes by 1 leſs than the number of terms.

2. The ſum of the ſeries.

This is had from the 2d caſe of problem 1.

$$\text{Thus, } d = \frac{z-a}{n-1}, \text{ and } s = \frac{a+z}{2} \times n.$$

EXAMPLES.

1. If the extremes be 3 and 19, and the number of terms 9; what is the common difference, and ſum of the ſeries?

Anſ. The difference is 3, and the ſum is 99.

2. If the extremes be 10 and 70, and the number of terms 21; what is the common difference, and the ſum of the ſeries? Anſ. The difference is 3, and the ſum is 840

3. What debt can be diſcharged in a year, by weekly payments in arithmetical progreſſion, whereof the firſt term or payment is 1, and the laſt 5l 3s; and what is the common difference of the ſeries of payments?

Anſ. The difference is 2s, and the debt is 135l 4s.

GEOMETRICAL PROGRESSION.

A Geometrical Progreſſion is a ſeries of numbers, of which the ſucceeding terms are either all greater or all leſs than their adjacent preceding terms, in ſuch ſort, that the ratio or quotient of every two adjacent terms is the ſame.

Note. The ſame thing is true with reſpect to the products of the terms of a geometrical proportion as was obſerved of the ſums of the terms of an arithmetical proportion, in the note in page 124. That is, the product of any two terms, is equal to the product of any other two terms, taken at an equal diſtance, but on contrary ſides of the former; or that the ſquare of any one term, is equal to the product of any two terms, taken at an equal diſtance from it on each ſide. And the ſame analogy holds good in moſt of their problems; for that many of their rules are almoſt verbally the ſame, and differ only in this, that inſtead of the operations of addition, ſubtraction, multiplication, and diviſion in arithmetical progreſſion, are required reſpectively thoſe of multiplication, diviſion, involution, and evolution, in geometrical progreſſion.

PROBLEM I.

Given one of the extremes, the ratio, and the number of the terms of a geometrical ſeries; to find

1. The other extreme.

RULE. Raiſe the ratio to the power whoſe index is one leſs than the number of terms; by which multiply the laſt term to give the greateſt, or divide the greateſt term to find the leaſt.

2. The ſum of the ſeries.

RULE. Divide the difference of the extremes, by the ratio leſs 1, to the quotient add the greater extreme, and it will give the ſum of the ſeries. Or multiply the greateſt term by the ratio, from the product ſubtract the leaſt term, then divide the difference by the ratio leſs 1, and the quotient will be the ſum of the ſeries.

Thus, if a repreſent the leaſt term,
z the greateſt,
r the ratio,
n the number of the terms, and
s the ſum of the ſeries;

$$\text{then} \begin{cases} z = a \times r^{n-1} \\ a = n \div s^{n-1} \end{cases} \quad \text{and} \begin{cases} s = \dfrac{r^{n}-1}{r-1} \times a \\ s = \dfrac{r^{n}-1}{r-1} \times \dfrac{z}{r^{n}-1} \end{cases}$$

EXAMPLES.

1. Given the leaſt term 1, the ratio 2, and the number of terms 10; what is the greateſt term, and the ſum of the ſeries?

Anſ. The greateſt term is 512, and the ſum 1023.

2. If the greateſt term be 885735, the ratio 3, and the number of terms 12, what is the leaſt term, and the ſum of the ſeries? Anſ. The leaſt term is 5, and the ſum 1328600.

3. What debt will be diſcharged in a year or 12 months by paying 1l the firſt month, 2l the ſecond, 4l the third, and ſo on, each ſucceeding payment being double the laſt; and what will the laſt payment be?

Anſ. The debt is 4095l, and the laſt payment 2048l.

PROBLEM II.

Given the extremes and the ratio, to find

1. The ſum of the ſeries.

This is found by the ſecond caſe of the laſt problem.

2. The number of terms.

RULE. Divide the greateſt term by the leaſt; find what power of the ratio is equal to the quotient; then add 1 to the index of that power, and the ſum will be the number of terms. Or, divide the difference of the logarithms of the extremes by the logarithm of the ratio, add 1 to the quotient, and the ſum will be the number of terms.

$$\text{Thus, } s = \frac{z-a}{r-1} + z = \frac{rz-a}{r-1} \text{ and}$$

$$n = \frac{\log. z - \log. a.}{\log. r.} + 1 = \frac{\log. z - \log a + \log. r}{\log. r.}.$$

EXAMPLES

EXAMPLES.

1. If the extremes be 1 and 512, and the ratio 2, what is the ſum of the ſeries, and the number of terms?

Anſ. The ſum is 1023, and the number of terms 10.

2. If the extremes be 5 and 885735, and the ratio 3; what is the ſum of the ſeries, and the number of terms?

Anſ. The ſum is 1328600, and the number of terms 12.

3. What debt will be diſcharged by monthly payments in geometrical progreſſion, the firſt of which is 1l, and the laſt 2048l, the ratio being 2; and in what time will it be diſcharged?

Anſ. The debt is 4095l, and it will be diſcharged in a year.

PROBLEM III.

Given the extremes and the number of terms, to find

1. The ratio.

This is found as in problem 2, by dividing the greater extreme by the leſs, and extracting that root of the quotient whoſe index is 1 leſs than the number of terms.

2. The ſum of the ſeries.

This is found as in problem 1.

$$\text{Thus, } r = \sqrt[n-1]{\frac{z}{a}}, \text{ and } s = \frac{\sqrt[n-1]{z^n} - \sqrt[n-1]{a^n}}{\sqrt[n-1]{z} - \sqrt[n-1]{a}}$$

EXAMPLES.

1. Given the extremes 1 and 512, and the number of terms 10; to find the ratio, and the ſum of the ſeries.

Anſ. The ratio is 2, and the ſum is 1023.

2. If the extremes of a ſeries, conſiſting of 12 terms, be 5 and 885735; what is the ratio, and the ſum of the ſeries?

Anſ. The ratio is 3, and the ſum is 1328600.

3. What debt can be diſcharged in a year by monthly payments, in geometrical progreſſion, of which the firſt payment is 1l, and the laſt 2048; and what will the ratio of the ſeries be?

Anſ. The ratio will be 2, and the debt 4095l.

SINGLE POSITION.

THIS rule is alſo called Falſe Poſition, or falſe ſuppoſition, becauſe it makes a ſuppoſition of falſe numbers, as if they were the true ones, and by their means, diſcovers the true numbers ſought.

The ſingle rule uſes only one ſuppoſition, but the double rule two; whence come their names.

To the rule of poſition belong ſuch queſtions as cannot be reſolved by the direct proceſs by any of the former rules; and in which the required number or numbers do not aſcend above the firſt power: ſuch, for example, as moſt of the queſtions uſually brought to exerciſe the reduction of ſimple equations in algebra. But it will not bring out true anſwers when the numbers ſought aſcend above the firſt power; for then the reſults are not proportional to their poſitions, nor the errors to the difference of the true number and each poſition; yet in all ſuch caſes it is a very good approximation, and in exponential equations, as well as many other things, ſucceeds better than perhaps any other method.

Thoſe queſtions, in which the reſults are proportional to their ſuppoſitions, belong to ſingle poſition: ſuch are thoſe which require the multiplication or diviſion of the number ſought by any number, or in which it is to be increaſed or diminiſhed by itſelf any number of times, or by any part or parts of it. But thoſe in which the reſults are not proportional to their poſitions, belong to the double rule; ſuch are thoſe, in which the number ſought is increaſed or diminiſhed by ſome given number, which is no known part of the number required.

To work Queſtions in Single Poſition.

Take any number, and perform the ſame operations with it as, in the queſtion, are deſcribed to be performed with the number ſought; then if the reſult be the ſame with that in the queſtion, the ſuppoſed number is the number ſought; but if it be not, ſay, as the reſult of the operation is to the poſition, ſo is the reſult in the queſtion to the number required.

EXAMPLES.

EXAMPLES.

1. A perſon after ſpending $\frac{1}{3}$ and $\frac{1}{4}$ of his money, has yet remaining 60l; what had he at firſt?

1. Suppoſe he had at firſt 120l.		Proof.	
Now $\frac{1}{3}$ of 120 is	40	$\frac{1}{3}$ of 144 is	48
$\frac{1}{4}$ of it is	30	$\frac{1}{4}$ of 144 is	36
their ſum is	70	their ſum	84
which taken from	120	taken from	144
leaves	50	leaves	60 as per queſtion.

Then, 50 : 120 : : 60 : 144, the anſwer.

2. What number is that, which multiplied by 7, and the product divided by 6, the quotient may be 14? Anſ. 12.

3. What number is that, which being increaſed by $\frac{1}{2}$, $\frac{1}{3}$, and $\frac{1}{4}$ of itſelf, the ſum ſhall be 125? - Anſ. 60.

4. A general, after ſending out a foraging $\frac{1}{2}$ and $\frac{1}{3}$ of his men, had yet remaining 700; what number had he in command? - - - - Anſ. 4200.

5. A gentleman diſtributed 78 pence among a number of poor people, conſiſting of men, women, and children; to each man he gave 6d, to each woman 4d, and to each child 2d: moreover there were twice as many women as men, and thrice as many children as women. How many were there of each? Anſ. 3 men, 6 women, and 18 children.

6. One being aſked his age, ſaid, if $\frac{3}{5}$ of the years I have lived, be multiplied by 7, and $\frac{2}{3}$ of them be added to the product, the ſum will be 292. What was his age?

Anſ. 60 years.

DOUBLE POSITION.

HAVING taken any two convenient number, for the poſitions, proceed with each, according to the conditions of the queſtion, as if they were the true numbers ſought; and find how much the reſults are different from the reſult in the queſtion. Next multiply each of theſe errors or differences by the other's poſition; then if the errors be of the ſame affection, that is if the reſults be both either too great or too little, divide the difference of the products by the difference of the errors, and the quotient will be the anſwer; but if the errors be of different affections, that is, if one reſult be too great and the other too little, divide the ſum of the products by the ſum of the errors, and the quotient will be the anſwer.

Or having found the errors, ſay, As the ſum of the errors when they are of different kinds, or as the difference of the errors, when they are of the ſame kind, is to the difference of the ſuppoſitions, ſo is the leaſt error to the correction of the ſuppoſition belonging to this error; which muſt be added to, or ſubtracted from it, according to the following conditions, viz. if the errors be of the ſame kind, add the correction to this ſuppoſition if it is greater than the other ſuppoſition, or ſubtract when it is the leſs; but if the errors be of different kinds, do the contrary, viz. add when that ſuppoſition is the leſs, and ſubtract when it is the greater of the two; and the ſum or difference will be the number ſought.

EXAMPLES.

1. What number is that, which being multiplied by 6, the product increaſed by 18, and the ſum divided by 9, the quotient will be 20?

Firſt, ſuppoſe 30 to be the number ſought.

Then $\frac{30 \times 6 + 18}{9} = 10 \times 2 + 2 = 20 + 2 = 22$; but ought to be 20; therefore the error is 2 in exceſs.

Again, ſuppoſe 18 to be the number ſought.

Then $\frac{18 \times 6 + 18}{9} = 2 \times 6 + 2 = 12 + 2 = 14$; but ought to be 20; therefore the error is 6 in defect.

And the errors are of different kinds or affections.

Whence, by the firſt rule, $\frac{30 \times 6 + 18 \times 2}{2 \times 6 = 8} = \frac{15 \times 3 + 9}{2}$ $= \frac{54}{2} = 27$, the number ſought.

And by the ſecond rule, $2 + 6 : 30 - 18 :: 2 : \frac{2 \times 12}{8} =$ 3, the correction; then $30 - 3 = 27$, the number ſought.

2. A ſon aſking his father how old he was, receives the following anſwer: Your age is now $\frac{1}{4}$ of mine; but 5 years ago your age was only $\frac{1}{5}$ of mine at that time. What are their ages? - - - - Anſ. 80 and 20.

3. A work-

3. A workman was hired for 30 days, at 2s 6d per day, for every day he worked; but with this condition, that for every day he played, he ſhould forfeit 1s. Now it ſo happened, that upon the whole he had 2l 14s to receive. How many of the days did he work? - - Anſ. 24.

4. A and B began to play together with equal ſums of money: A firſt won 20 guineas, but afterwards loſt back $\frac{2}{3}$ of what he then had; after which, B had 4 times as much as A. What ſum did each begin with? Anſ. 100 guineas.

5. Two Perſons, A and B, have both the ſame income, A ſaves $\frac{1}{5}$ of his; but B, by ſpending 50l per annum more than A, at the end of 4 years finds himſelf 100l in debt. What doth each receive and ſpend per annum?

Anſ. They receive 125l per annum; alſo A ſpends 100l, and B ſpends 150l per annum.

PROMISCUOUS QUESTIONS.

1. A Was born when B was 21 years of age: How old will A be when B is 47; and what will be the age of B when A is 60? - - Anſ. A 26, B 81.

2. What difference is there between twice five, and twenty, and twice twenty-five? - Anſ. 20.

3. What number taken from the ſquare of 48, will leave 16 times 54? - - - Anſ. 1440.

4. What number added to the thirty-firſt part of 3813, will make the ſum 200? - - Anſ. 77.

5. What number deducted from the 23d part of 29440, will leave the 64th part of the ſame? - Anſ. 820.

6. The remainder of a diviſion is 325, the quotient 467, the diviſor is 43 more than the ſum of both: What is the dividend? - - - - Anſ. 390270.

7. A perſon at the time of out-ſetting in trade, owed 350l; and had in caſh 5307l 10s, in wares 713l 7d, and in good debts 210l 5s 0d. Now after having traded a year, he owed 703l 17s, and had in caſh 4874l 9s 4d, in bills 350l, in wares 1075l 14s $3\frac{1}{2}$d, and in recoverable debts 613l 13s $10\frac{1}{2}$d. What was his real gain that year? Anſ. 329l 4s 1d.

8. Two perſons depart from the ſame place at the ſame time, the one travels 30, the other 35 miles a day: How

far are they diſtant after 7 days, if they travel both the ſame road, and how far if they travel in contrary directions?

Anſ. 35 and 455 miles.

9. A gentleman's daily expence is 4l 8s $1\frac{19}{365}$d, and he ſaves 500l in the year: What is his yearly income?

Anſ. 2107l 12s.

10. Having a piece of land 11 poles in breadth, I demand what length of it muſt be taken to contain an acre, when four poles in breadth require 40 poles in length to contain the ſame. - - - Anſ. 14 pls 3 yds.

11. If a gentleman whoſe annual income is 1000l, ſpend 20 guineas a week, whether will he ſave or run in debt, and how much in the year? - - Anſ. 92l debt.

12. In the latitude of London, the diſtance round the earth, meaſuring in the parallel of Latitude, is about 15550 miles, now as the earth turns round in 23 hours 56 minutes, at what rate per hour is the city of London carried by this motion from weſt to eaſt? Anſ. $649\frac{259}{359}$ miles an hour.

13. In order to raiſe a joint ſtock of 10000l, A, B, and C together, ſubſcribe 7950l, and D the reſt: Now A and B are known together to have ſet their hands to 5800l, and A has been heard to ſay that he had undertaken for 550l more than B. What did each proprietor advance?

Anſ. A 3175, B 2625, C 2150, D 2050.

14. A tradeſman increaſed his eſtate annually by 100l more than $\frac{1}{4}$ part of it, and at the end of 4 years found that his eſtate amounted to 10342l 3s 9d. What had he at outſetting? - - - Anſ. 4000l

15. Paid 1012l 10s for 750l, taken in 7 years ago; at what rate per cent per annum did I pay intereſt? Anſ. 5l

16. What is the intereſt of 720l for 73 days, or $\frac{1}{5}$ of a year, at 3l per cent per annum? - Anſ. 4l 6s 4d $3\frac{1}{5}$q.

17. Part 1200 acres of land among A, B, and C. ſo that B may have 100 more than A, and C 64 more than B.

Anſ. A 312, B 412, and C 476.

18. Divide 1000 crowns, give A 120 more, and B 95 leſs than C. - - Anſ. A 445, B 230, C 325.

19. To how much amounts the order for which my factor, at the rate of $2\frac{1}{2}$ per cent, receives 22l 10s? Anſ. 900l.

20. What ſum of money will amount to 132l 16s 3d, in 15 months, at 5 per cent per annum ſimple intereſt?

Anſ. 125l.

21. Laid out 165l 15s in wine at 4s 3d a gallon; ſome of which receiving damage in carriage, I ſold the reſt at 6s 4d a gallon, which produced only 110l 16s 8d. What quantity was damaged? - - Anſ. 433 gal.

22. A father divided his fortune among his ſons, giving A 4 as often as B 3, and C 5 as often as B 6; what was the whole legacy, ſuppoſing A's ſhare were 5000l. Anſ. 11875l.

23. A ſtationer ſold quills at 10s 6d a thouſand, by which he cleared $\frac{1}{3}$ of the money; but growing ſcarce, he raiſed them to 12s a thouſand: what did he clear per cent by the latter price? - - - Anſ. 71l 8s $6\frac{6}{7}$d.

24. If 1000 men beſieged in a town, with proviſions for 5 weeks, allowing each man 16 oz a day, were reinforced with 500 men more; and hearing that they cannot be relieved till the end of 8 weeks; how many ounces a day muſt each man have, that the proviſion may laſt that time?

Anſ. $6\frac{2}{3}$oz.

25. If a quantity of proviſions ſerve 1500 men 12 weeks, at the rate of 20 ounces a day for each man; how many men will the ſame proviſions maintain for 20 weeks, at the rate of 8 oz a day for each man? - Anſ. 2250 men.

26. In what time will the intereſt of 72l 12s equal that of 15l 5s for 64 days, at any rate of intereſt? Anſ. $13\frac{161}{365}$days.

27. A perſon poſſeſſed of $\frac{3}{8}$ of a ſhip, ſold $\frac{2}{3}$ of his ſhare for 1260l; what was the reputed value of the whole at the ſame rate? - - - Anſ. 5040l.

28. What ſum of money at $4\frac{1}{2}$ per cent, will clear 29l 15s in a year and a half's time? - Anſ. 440l 14s $9\frac{7}{9}$d.

29. What number is that, to which if $\frac{2}{7}$ of $\frac{5}{9}$ be added, the ſum will be 1? - - Anſ. $\frac{53}{63}$.

30. A father dying, left his ſon a fortune, $\frac{1}{4}$ of which he ran through in 8 months; $\frac{3}{7}$ of the remainder laſted him a twelvemonth longer, after which he had bare 410l left. What did his father bequeath him? Anſ. 956l 13s 4d.

31. Bought a quantity of goods for 250l, and 3 months after ſold it for 275l. How much per cent per annum did I gain by them? - - - Anſ. 40l.

32. A guardian paid his ward 3500l for 2500l which he had in his hand 8 years. What rate of intereſt did he allow him? - - - Anſ. 5 per cent.

33. Bought a quantity of goods for 150l ready money, and ſold it again for 200l payable at the end of 9 months;

what was the gain in ready money, ſuppoſing rebate to be made at 5 per cent. - - Anſ. 42l 15s $5\frac{5}{83}$d.

34. A perſon being aſked the hour of the day, ſaid, The time paſt noon is equal to $\frac{4}{5}$ths of the time till midnight. What was the time? - - Anſ. 20 min. paſt 5.

35. A perſon looking on his watch, was aſked what was the time of the day, who anſwered, It is between 4 and 5; but a more particular anſwer being required, he ſaid that the hour and minute hands were then exactly together: What was the time? - Anſ. $21\frac{9}{11}$ min. paſt 4.

36. With 12 gal. of Canary, at 6s 4d a gal. I mixed 18 gal. of white wine, at 4s 10d a gal. and 12 gal. of cyder at 3s 1d a gal. At what rate muſt I ſell a quart of this compoſition ſo as to clear 10 per cent; - - Anſ. 1s $3\frac{5}{7}$d.

37. Suppoſe that I have $\frac{3}{16}$ of a ſhip worth 1270l, what part of her have I left after ſelling $\frac{2}{5}$ of $\frac{4}{9}$ of my ſhare, and what is it worth? - - Anſ. $\frac{37}{240}$, worth ~~185l~~. 195l 15

38. What length muſt be cut off a board $8\frac{3}{8}$ inches broad, to contain a ſquare foot, or as much as 12 inches in length and 12 in breadth? - - Anſ. $17\frac{13}{67}$ inches.

39. What ſum of money will produce as much intereſt in $3\frac{1}{4}$ years, as 210l 3s can produce in 5 years and 5 months?

Anſ. 350l 5s.

40. There is gained by trading with a ſhip 120l 14s. Now ſuppoſe that $\frac{1}{4}$ of her belongs to S, $\frac{3}{8}$ to T, $\frac{1}{8}$ to V, and the reſt to W; what muſt each have of the gain?

Anſ. S 30l 3s 6d, T 45l 5s 3d, V 15l 1s 9d, W 30l 3s 6d.

41. If 100l in 5 years be allowed to gain 20l 10s, in what time will any ſum of money double itſelf at the ſame rate of intereſt? - - - Anſ. $24\frac{16}{41}$ years.

42. What difference is there between the intereſt of 350l at 4 per cent for 8 years, and the diſcount of the ſame ſum at the ſame rate, and for the ſame time? Anſ. 27l $3\frac{1}{33}$s.

43. If, by ſelling goods at 50s. per cwt, I gain 20 per cent, what do I gain or loſe per cent, by ſelling at 45s per cwt. - - - Anſ. 8l gain.

44. If, by remitting to Holland, at 34s 6d per l ſterling, $4\frac{1}{2}$ per cent be gained; how goes the exchange, when by remittance I clear 10 per cent. - Anſ. 36s $2\frac{165}{209}$d.

45. Sold goods for 60 guineas, and by ſo doing loſt 17 per cent, whereas I ought, in dealing, to have cleared 20

per cent. Then how much under their juſt value were they ſold? - - - - Anſ. 28l 1s $8\frac{20}{87}$d.

46. If, by ſelling goods at 27d per lb, I gain cent per cent, what do I clear per cent by ſelling for 9 guineas per cwt. - - - Anſ. 50 per cent.

47. If 20 men can perform a piece of work in 12 days, how many will accompliſh another that is thrice as much in one 5th of the time? - - Anſ. 300.

48. A younger brother received 6300l, which was juſt $\frac{7}{9}$ of his eldeſt brother's fortune: What was the father worth ~~at~~ his death? - - - Anſ. 14400l.

49. A perſon making his will gave to one child $\frac{13}{20}$ of his eſtate, and the reſt to another; and when theſe legacies came to be paid, the one turned out 600l more than the other: What did the teſtator die worth? - Anſ. 2000l.

50. A father deviſed $\frac{7}{18}$ of his eſtate to one of his ſons, and $\frac{7}{18}$ of the reſidue to another, and the ſurplus to his relict for life; the children's legacies were found to be 257l 3s 4d different: Pray what money did he leave the widow the uſe of? - - - Anſ. 635l $10\frac{30}{49}$d.

51. What number is that, from which if you take $\frac{2}{7}$ of $\frac{3}{8}$, and to the remainder add $\frac{7}{16}$ of $\frac{1}{20}$, the ſum will be 10?

Anſ. $10\frac{191}{2240}$.

52. There is a number which, if multiplied by $\frac{2}{3}$ of $\frac{7}{8}$ of $1\frac{1}{2}$, will produce 1: What is the ſquare of that number?

Anſ. $1\frac{15}{49}$.

53. A perſon dying left his wife with child, and making his will, ordered that if it ſhould be a ſon, $\frac{2}{3}$ of his eſtate ſhould belong to him, and the remainder to his mother; and if a daughter, he appointed the mother $\frac{2}{3}$ and the girl the remainder: but it happened that ſhe was delivered both of a ſon and a daughter? by which ſhe loſt in equity 2400l more than if it had been only a girl; What would have been her dowry had ſhe had only a ſon?

Anſ. 2100l.

54. Three perſons purchaſe together a ſhip, toward the payment of which A advanced $\frac{2}{9}$, and B $\frac{2}{7}$ of the value, and C 200l. How much paid A and B, and what part of the veſſel had C? - Anſ. A $90\frac{10}{31}$l, B $116\frac{4}{31}$l, C $\frac{31}{63}$ part.

55. A and B clear by an adventure at ſea, 60 guineas, with which they agree to buy a horſe and chaiſe, of which

they were to have the uſe, in proportion to the ſums adventured, which was found to be A 9 to B 8; they cleared 45 per cent. What money then did each ſend abroad?

Anſ. A 74l 2s $4\frac{4}{17}$d, and B 65l 17s $7\frac{13}{17}$d.

56. In an article of trade, A gains 18s 3d, and his adventure was 40s more than B's, whoſe ſhare of profit is but 12s. What are the particulars of their ſtock?

Anſ. A 5l 16s $9\frac{3}{5}$d, and B 3l 16s $9\frac{3}{5}$d.

57. Three perſons entered joint trade, to which A contributed 240l, and B 210l; they clear 120l, of which 30l belongs of right to C. Required that perſon's ſtock, and the ſeveral gains of the other two?

Anſ. C's ſtock 150l, A gained 48l, and B 42l.

58. A and B in partnerſhip equally divide the gain; A's money, which was 96l 12s, lay for 15 months, and B's for no more than 6: What was the adventure of the latter?

Anſ. 241l 10s.

59. Put out 420l to intereſt, and in $6\frac{1}{2}$ years time there was found to be due 556l 10s. What was the rate of intereſt?

Anſ. 5 per cent.

60. A clears 12l in 6 months, B 15l in 5 months, and C, whoſe ſtock was 40l, clears 21l in 9 months? What was the whole ſtock? - - - - Anſ. $125\frac{5}{7}$l.

61. A had 12 pipes of wine, which he parted with to B at $4\frac{1}{2}$ per cent profit, who ſold them to C for 40l 12s advantage; C made them over to D for 605l 10s, and cleared thereby 6 per cent. How much a gallon did this wine coſt A?

Anſ. 6s $8\frac{6640}{11077}$d.

62. A of Amſterdam, orders B of London to remit to C of Paris, at $52\frac{1}{2}$d ſterling a crown, and to draw on D of Antwerp for the value at $34\frac{1}{4}$s flem. a l ſterling; but as ſoon as B received the commiſſion, the exchange was on Paris at 53d a crown: pray at what rate of exchange ought B to draw on D, to execute his orders, and be no loſer?

Anſ. 34s $2\frac{5}{53}$d.

63. A, with intention to clear 20 guineas on a bargain with B, rates hops at 15d a lb, which coſt him $10\frac{1}{2}$d; B, appriſed of that, ſets down malt, which coſt 20s a quarter, at an adequate price: For how much malt did they contract?

Anſ. 49 qr.

64. A and B venturing equal ſums of money, clear, by joint trade, 180l. By agreement A was to have 8 per cent,

becauſe he ſpent time in the execution of the project, and B was to have only 5: What ſum was allotted to A for his trouble? - - - Anſ. 41l 10s $9\frac{3}{13}$d.

65. Laid out in a lot of muſlin 500l, upon examination of which 3 parts in 9 proved damaged, ſo that I could make but 5s a yard of the ſame; and by ſo doing find I loſt 50l by it. At what rate per ell am I to part with the undamaged muſlin, in order to gain 50l upon the whole?

Anſ. 11s $7\frac{2}{7}$d.

66. A at Paris draws on B in London 1400 crowns, at 46d ſterling a crown, for the value of which B draws again on A at 57d ſterling a crown, beſides reckoning commiſſion $\frac{1}{2}$ per cent. Did A gain or loſe by this tranſaction, and what?

Anſ. He gained $17\frac{13}{19}$ crowns.

67. A, B, and C are in company; A put in his ſhare of the ſtock for 6 months, and laid claim to $\frac{1}{6}$ of the profits; B put in his for 9 months; C advanced 500l for 8 months, and required on the balance $\frac{3}{5}$ of the gain: Required the ſtock of the other two adventurers?

Anſ. A 185l 3s $8\frac{4}{9}$d, and B 172l 16s $9\frac{13}{27}$d.

68. A young hare ſtarts 40 yards before a greyhound, and is not perceived by him till ſhe has been up 40 ſeconds, ſhe ſcuds away at the rate of 10 miles an hour, and the dog, on view, makes after her at the rate of 18. How long will the courſe hold, and what ground will be run over, beginning with the out-ſetting of the dog?

Anſ. $60\frac{5}{22}$ ſec. and 530 yards run.

69. If I leave Exeter at 8 o'clock on Monday morning for London, and ride at the rate of 3 miles an hour without intermiſſion; and B ſet out from London for Exeter at 4 the ſame evening, and ride 4 miles an hour conſtantly: Suppoſing the diſtance between the two cities to be 130 miles, whereabout on the road ſhall we meet?

Anſ. $69\frac{3}{7}$ miles from Exeter.

70. A reſervoir for water has two cocks to ſupply it; by the firſt alone it may be filled in 40 minutes, by the ſecond in 50 minutes, and it hath a diſcharging cock, by which it may, when full, be emptied in 25 minutes. Now, ſuppoſing that theſe three cocks are all left open, and that the water comes in, in what time, ſuppoſing the influx and efflux of the water to be always alike, would the ciſtern be filled?

Anſ. 3 hrs 20 min.

71. A ſets out of London for Lincoln, at the very ſame time that B at Lincoln ſets forward for London, diſtant 100 miles: After 7 hours they meet on the road, and it then appeared that A had rode $1\frac{1}{2}$ miles an hour more than B: at what rate an hour did each of them travel?

Anſ. A $7\frac{25}{28}$, and B $6\frac{11}{28}$ miles.

72. A and B truck; A has $12\frac{1}{2}$ cwt of Farnham hops, at 2l 16s a cwt, but in barter inſiſts on 3l. B has wine worth 5s a gallon, which he raiſes in proportion to A's demand. On the balance, A received but a hhd of wine: What had he in ready money? - Anſ. 20l 12s 6d.

73. A of Amſterdam owes to B of Paris, 3000 guilders of current ſpecie, which he is to remit to him, by order, the exchange 91d flem. de banco a crown, the agio 4 per cent; but when this was to be negociated, the exchange was down at 90d a crown, and the agio 5 per cent. What did B get by this turn of affairs?

Anſ. 5 liv 12 ſol $8\frac{384}{1183}$ den.

74. If 100 eggs be laid down upon the ground, in a ſtraight line, one yard from each other, and the firſt of them one yard from a baſket; what ſpace ſhall a man walk over in bringing the eggs one by one to the baſket?

Anſ. 10100 yds, or 5 miles 1300 yds.

A COURSE *of* BOOK-KEEPING *according to the Method of* SINGLE ENTRY; *with a* DESCRIPTION *of the* BOOKS, *and* DIRECTIONS *for uſing them: Very uſeful either for young Book-keepers entering into Buſineſs, or for Maſters to teach in their Schools.*

IT is very neceſſary that almoſt every perſon who is intended for buſineſs, ſhould learn a courſe of book-keeping of this kind, becauſe it is uſed in almoſt every ſhop. The Italian method alone is not ſufficient; for it is a conſtant complaint among the merchants, and others, who uſe this method, that their boys, having learnt only the Italian method, when they firſt come to buſineſs, are almoſt as ignorant in the management of their books, as if they had never learnt any method at all. There are ſome boys who have not time to learn, or perhaps a capacity to underſtand, a complete courſe of the Italian method; there are alſo many intended for ſuch kinds of buſineſs, as that the Italian method would be thrown away upon them: to all ſuch then this method will be very uſeful. And even ſuppoſing a boy were intended for a buſineſs which requires the Italian method alone, I would, notwithſtanding, have him taught this method firſt, if it were only to faciliate his aquiſition of the other. This method is ſo eaſy, that it may alſo be taught in a few weeks time to young ladies as well as young gentlemen.

The forms of the books may be ſufficiently known by inſpection.—In the day book, every perſon's name, is ſet down *Dr. to* the things he receives from you on truſt, and *Cr. by* thoſe which you receive from him. In the margin of the day-book are written the pages where the accounts ſtand in the ledger: inſtead of theſe marginal figures, ſome make only a ſtroke or daſh with the pen, to ſhew that the account has been poſted, that is, entered in the ledger; but it is better to uſe the figures, for they ſhew, not only that the account has been poſted, but likewiſe where to find it in the ledger. without looking in the alphabet. In the day-book I have ſet down only the total amount of all the articles of each day, collected into one ſum: having purpoſely omitted the amount or value of each ſingle line or article, every one of which the learner is to compute by way of exerciſe, and as it were in real trade, and enter in their proper columns in the day-book as he copies it out. Then the printed ſum totals will ſhew him if he has computed the particulars rightly.

I have entered in the day-book what is received as well as what is delivered, which is abſolutely neceſſary in teaching; for the learner ought to make out all his own ledger from his day-book.

There are ſeveral other books kept by moſt merchants, as the caſh-book, the book of houſe expences, the invoice book, &c.

Directions for the Learner.

Having ruled your books in the proper form, copy into the day-book one month's accounts; then calculate them upon your ſlate or waſte paper, to find if they be rightly caſt up, and to exerciſe you in calculations. Next rule your ſlate or waſte paper in the form of the ledger, and upon it poſt the accounts that were copied in the day book, with their dates prefixed; obſerving to ſet on the Dr. ſide of each perſon's account, thoſe accounts to which he is Dr. in the day-book, and on the Cr. ſide, thoſe by which he is Cr. And if any account conſiſt but of one article, you are to expreſs it particularly with its money in the columns; but if of ſeveral, write *to* or *by* ſundries, placing the ſum of the amounts of all the articles in the columns. After the accounts are, by correcting if neceſſary, placed according to the teacher's mind, tranſcribe them into your ledger, leaving a proper ſpace under each perſon's name to receive more accounts. Then under the proper letters in the alphabet, enter thoſe names with the pages where they ſtand in the ledger; and, laſtly, write the ledger pages to the ſeveral accounts in the day-book. Do the ſame with the next month's accounts; and ſo on, till the whole be finiſhed.— But obſerve that you muſt not enter any perſon's name down again which has been entered before, till the ſpace firſt aſſigned to it ſhall be filled with articles; and then the account muſt be transferred to a new place, as you may obſerve is done with Lady Strawberry's account.

When the firſt ledger, titled A, is filled with accounts, you muſt, as is done with the following ledgers, transfer the unbalanced accounts to the ſecond ledger, titled B, and ſo on, according to the order of the letters of the alphabet; and at the end of the old ledger draw out a balance account, placing your debts on one ſide, and your credits on the other.

THE DAY BOOK.

	January 1, 1783.			l	s	d
1	*Mr. James Elford, of Bath, Dr.*					
		s	d			
	To 15 yds of fine broad cloth at	13	6			
	— 24 - ſuperfine - -	18	9			
				32	12	6
1	*George Robſon, Eſq. of York, Dr.*					
		s	d			
	To 12 gal palm-ſack - - at	8	6			
	— 17 — red port - - -	5	8			
	— 9 —claret - - -	8	9			
				13	17	1
	4					
1	*Mrs Mary Maſterman Dr.*					
		s	d			
	To 1½ lb green tea - - at	16	0			
	— 2¼ — congou, - - -	9	6			
	— 0¼ — ſtone of ſugar, - -	5	0			
	— A lump of ſugar wt 20½lb at	0	8			
				3	0	3½
	9					
2	*Lady Strawberry, Dr.*					
		s	d			
	To 9½ yds of ſilk - - at	12	9			
	— 13 - flowered ditto -	15	6			
				16	2	7½

January

					l	s	d
	January 20, 1783.						
	Sir Jonas More Dr.						
2	To a ream of thick poſt paper				1	0	0
	27						
	Mr James Wilſon Schoolmaſter Dr.						
2			s	d			
	To 6 Hutton's Arithmetics at		2	3			
	— 3 doz. copy books		2	6			
	— 2 quires of foolſcap		0	10			
	— 1 quire thin poſt				0	1	0
					1	3	8
	Feb. 5.						
	Mr Alderman Ableman Dr.						
3		l	s	d			
	To a ledger ruled					15	
	— 5 c quills at	0	2	6			
	— 3 reams thick poſt	1	0	0			
	— 6 quires pot	0	0	8			
	— 40 reams blue demy	0	5	6			
	— 2 penknives and an inkſtand					6	
					15	17	6
	12						
	William Winton, Eſq. Dr.						
3			s	d			
	To 20 oz nutmegs at		0	3			
	— 5½ lb coffee		4	0			
	— 3¼ — cocoa		2	4			
	— 4 — almonds		1	0			
	— 8½ — raiſins		0	7			
					2	3	6½
	20						
	Mr William Watſon Dr.						
3			s	d			
	To 2 gal rum at		10	0			
	— 4 — brandy		10	6			
	— 3 — Eng. gin.		5	0			
					3	17	0

Feb.

		oz	dwt	gr.		s	d	l	s	d
	Feb. 27, 1783									
2	*Sir Jonas Moore Cr.*									
	By caſh received of him in full							1	0	0
	March 10									
4	*Sir Jeffery Slingſtone Dr.*									
	To a ſilver punch-bowl wt	23	4	0	at	5	10			
	— a tankard	10	3	6	—	6	2			
	— a teapot and lamp	30	5	12	—	7	3			
	— 6 plates	73	11	5	—	6	1			
	— 18 ſpoons	41	0	10	—	6	3			
								56	1	4
	22									
1	*George Robſon Eſq. of York Dr.*									
	To 27¾ gal of ſherry				at	6	2			
	— 22½ — rheniſh				—	6	4			
	— 34 — Liſbon					4	10			
								23	17	11½
	April 7									
4	*Sir Thomas Lawſon Dr.*									
	To 7½ yds of ſcarlet cloth				at	21	0			
	— 4 ſuperfine blue				—	20	0			
	— ¼ velvet				—	18	0			
	— 30 gold lace				—	10	6			
								27	17	0
	12									
2	*Lady Strawberry Dr.*									
	To 11¾ yds luſtring				at	6	10			
	— 14 — brocade				—	11	3			
								11	17	9½
	24									
1	*Mrs Mary Maſterman Cr.*									
	By caſh received of her in full							3	0	3½

	April 25, 1783			l	s	d
4	*David Johnſon Eſq. Dr.*					
		s	d			
	To 5 gal lamp oil - - at	4	2			
	— 3½ — train oil - - —	3	0			
	— ¾ — ſweet oil - - —	12	6			
				2	0	8½
	May 3					
1	*Mr James Elford of Bath Dr.*					
		s	d			
	To 27 yds of yard-wide cloth at	8	4			
	— 16 - drugget - - —	6	3			
	— 12 - ſerge - - —	2	10			
	— 32 - ſhalloon - - - —	1	8			
				20	12	4
	10					
4	*Sir Thomas Lawſon Dr.*					
		s	d			
	To 7 yds ſuperfine black cloth at	19	6			
	— 12 ſhalloon - - - - —	2	4			
	— 1 doz and 9 coat buttons - —	2	6			
	— 2 - 8 waiſtcoat ditto —	1	3			
				8	12	2½
	14					
5	*Mr. Nicholas Norton, of Durham, Dr.*					
		s	d			
	To 9 pair worſted ſtockings at	4	6			
	— 6 — ſilk ditto - - - —	15	9			
	— 17 — thread - - - —	5	4			
	— 23 — cotton - - —	4	10			
	— 14 — yarn - - - - —	2	4			
	— 18 — women's gloves - —	4	2			
	— 19 yds flannel - - —	1	7½			
				23	[illegible]	4½
	20					
4	*Sir Thomas Lawſon Cr.*					
	By a bill on Captain James Dixon -			10	0	0

May 20, 1783

4 *David Johnſon Eſq. Dr.*

		c	qr	lb		l	s	d	l	s	d
To 13 Cheſhire cheeſes	wt	5	3	12	at	1	12	6			
— 25 Gloucester	—	3	0	18	—	1	8	0			
— 47 Stilton	—	1	2	5	—	2	4	8			
									17	7	10

26

5 *Mrs Shields Dr.*

		d	l	s	d
To 8 lb rice	at	4½			
— 3½ — currants	—	5			
— 2 quarts vinegar	—	6			
			0	5	5½

June 3

5 *Captain James Dixon Dr.*

	qr	buſh			l	s	d	l	s	d
To	7	3	of wheat	at	1	8	0			
—	9	7	rye	—	1	1	6			
—	17	4	oats	—	0	10	8			
								30	5	5¾

12

4 *Sir Jeffery Slingſtone Cr.*

	l	s	d
By a bank note received by the ſervant	20	0	0

17

1 *Mrs Mary Maſterman Dr.*

		s	d	l	s	d
To 14 lb hard ſoap	at	0	6			
— 7 — ſoft	—	0	5			
— 3½ — ſtarch	—	0	5½			
— 3½ — blue	—	1	4			
— 40 — raiſins	—	0	4½			
— 3 — doz candles	—	5	9			
				2	8	5¼

21

1 *Mrs Maſterman Cr.*

		s	d
By 40 yds Ruſſia ſheeting	at	2	2

					l	s	d
	June 28, 1783.						
4	*David Johnſon Eſq. Dr.*						
		l	s	d			
	To 17 lb cream cheeſe - at	0	0	7½			
	— 53 ſtone 3 lb bacon —	0	4	8			
	— 15½ firk butter - —	1	8	0			
					34	12	11½
	July 3						
6	*Miſs Fanny Dawſon of Liverpool Dr.*						
			s	d			
	To 14 yds blue ribbon - at		0	7½			
	— 21 — white - - —		0	6			
	— 12½ — lace - - - —		3	6			
	— 9 — pair kid gloves - —		2	4			
					4	4	0
	7						
2	*Mr James Wilſon, Schoolmaſter, Cr.*						
	By caſh received in full - -				1	3	8
	10						
6	*Mr Roger Retail, of Newcaſtle upon Tyne, Dr.*						
			s	d			
	To 24½ lb royal green tea at		18	6			
	— 21¼ — imperial - - —		24	0			
	— 35¾ — beſt bohea - —		13	10			
	— 17⅔ — coffee - - —		5	4			
	— 25 double refined ſugar - —		1	1½			
	— 9 ſugar loaves, wt 137 lb —		0	7½			
					83	5	9
	17						
6	*Mr Charles Anderſon, Dr.*						
			s	d			
	To 6 mahogany chairs - at		18	6			
	— 2 elbow ditto - - —		25	0			
	— 2 pier glaſſes - - —		36	0			
					11	13	0

July 24, 1783.

6 *Mr Charles Anderſon Dr.*

		s	d	l	s	d
To 25 yds curtain ſtuff -	at	2	2			
— 12 — ticking - -	—	1	3			
— 3 ſtone of feathers -	—	25	0			
— 2 pier tables - -	—	50	0			
				12	4	0

28

5 *Captain James Dixon Dr.*

		s	d	l	s	d
To 12 buſh peas - -	at	2	9			
— 9 — beans - -	—	3	5			
— 17 — malt - -	—	4	8			
— 25 lb hops - - -	—	1	4			
				8	16	5

Auguſt 1

3 *William Winton Eſq Dr.*

		s	d	l	s	d
To 10 groſs of bottles -	at	22	0			
— 9 - ſmall ditto -	—	15	0			
— 2 doz of wine glaſses -	—	4	6			
— 3 decanters - -	—	1	2			
				18	7	6

7

3 *Mr Alderman Ableman Cr.*

	l	s	d
By a note upon Dr James for - -	10	0	0
— caſh in full - - - -	5	1	6
	15	7	6

12

4 *David Johnſon Eſq. Cr.*

	l	s	d
By caſh, in part - - - .	50	0	0

16

6 *Mr Charles Anderſon Cr.*

By 5 pockets of hops, at 48s - -

				l	s	d
	August 12, 1783.					
6	*Mr Charles Anderſon Dr.*					
		s	d			
	To a mahogany bedſtead - -			2	10	0
	— 2 ſtools at - - -	5	3			
	— poker, tongs, and fender - -			1	0	0
	— 2 other ſets of irons at -	15	0			
				5	10	6
	21					
7	*Mr Conrade Compound of Exeter Dr.*					
		s	d			
	To 21¾lb cochineal - - at	29	6			
	— 6¼ — opium - - —	6	4			
	— 53⅛ — ſcammony - —	8	10			
				56	19	5
	26					
7	*Mr John Baker Dr.*	s	d			
	To 5 groſs of braſs buttons at	18	0			
	— 2 - white - —	15	0			
	— 7 doz pair of buckles —	2	2 a pair			
	— 12 trunk locks - -	0	10 each			
	— 6 chamber ditto - —	2	6			
				16	7	0
	Sept. 3					
7	*Mrs March Dr.*	s	d			
	To 8 ſarcenet hoods, at - -	4	3			
	4					
2	*Mr James Wilſon, Schoolmaſter Dr.*					
		s	d			
	To 6 Hutton's Arithmetics - at	2	3			
	— 1 thouſ pinions - - -			0	2	6
	— 3 doz copy-books - - —	2	6			
	— 3 quires of thin poſt - —	1	0			
	— Lowth's Eng. Grammar - -			0	2	4
				1	8	10

Sept.

		l	s	d
	Sept. 6, 1783			
2	*Lady Strawberry Dr.*			
	To 12¼ yds ſattin - at - 10 8			
	9			
5	*Mr Nicholas Norton Cr.*			
	By a bank note for - - - -	20	0	0
	12			
2	*Lady Strawberry Dr.*			
	To 11⅜ yds velvet at - 18 0			
2	*Mr James Wilſon Schoolmaſter Dr.*			
	To the univerſal penman - -	1	5	0
	16			
7	*Mrs March of Cheſter, Dr.*			
	To 17 India fans ,at 3s 10d			
	18			
1	*Mrs Mary Maſterman Dr.*			
	To caſh in full - - - -	1	18	2¾
	22			
2	*Lady Strawberry Dr.*			
	By caſh received of the ſteward -	20	0	0
	24			
6	*Mr Charles Anderſon Cr.*			
	By caſh in full - - - -	17	7	8
	27			
7	*Mrs March Dr* s d			
	To 21 yds ſilver ribbon - at 2 2			
	— 11½ fine lace - - - 10 6			
		8	6	3
	Oct. 2,			
8	*Mr Samuel Edwards Dr.*			
	To 1¼ lb flax, at 1s - - -			
	4			
8	*Mr R. Barber, Briſtol, Stationer, Cr.*			
	By 30 reams of foolſcap paper, at 12s 6d			
	6			
8	*Lady Strawberry Dr.*			
	To 27¼ yds of Holland, at 5s 6d -			

	Oct. 6, 1783.			l	s	d
4	*David Johnſon Eſq. Cr.*					
	By caſh in full - - - -			4	1	6
	10					
9	*Mr Mathew Milton of Norwich Dr.*	s	d			
	To 40 ells of dowlas - - at	1	6			
	— 34 - diaper - - —	1	4½			
	— 31 - Holland - - —	5	8			
				14	2	5
	13					
8	*Lady Strawberry Dr.*					
	To 40 yds of iriſh cloth, at 3s 4d -					
	15					
9	*Mr Henry Foſter Dr.*					
	To 2½ cwt iron, at 18s 9d - -					
	21					
9	*Mrs Mary Gray Cr.*					
	By 3 ps of Iriſh cloth, quant. 87 yds at 2s 2d					
	23					
7	*Mr John Baker Cr.*					
	By caſh in part - - - -			10	0	0
7	*Mrs March Dr.*	s	d			
	To 9 pair of kid gloves - at	2	2			
	— 5 doz pair lamb's ditto - —	1	2			
	— 12 pieces of bobbin - —	0	6			
				4	15	6
	25					
8	*Lady Strawberry Cr.*					
	By caſh in full - - - -			39	0	5
	27					
1	*George Robſon Eſq. Cr.*					
	By caſh in full - - - -			37	15	0½

		l	s	d
	Oct. 30, 1783.			
8	*Mr Samuel Edwards Dr.*			
	d			
	To 12lb of flax - - - at 10			
	— 14 - - - - - — 9			
		1	0	6
	Nov. 4			
9	*Mr Matthew Milton, Cr.*			
	By 30 gal brandy at 8s 6d - -			
	— caſh in full - - - -	1	7	5
		14	2	5
	7			
10	*Samuel Simpſon Eſq. Dr.*			
	To 3 ſugar loaves, wt 32½lb, at 8½d -			
	13			
1	*Mr James Elford Cr.*			
	By a bill for - - -	50	0	0
	15			
5	*Captain James Dixon Cr.*			
	By 3 ps of Holland, qt 112½ ells, at 7s 6d			
5	*Captain James Dixon Dr.*			
	To caſh in full - - - -	3	1	10¼
	20			
10	*Samuel Simpſon Eſq. Dr.*			
	To 15½lb of currants, at 4d - -			
	22			
10	*Mr Thomas Grey Dr.*			
	s d			
	To 2 doz knives and forks at 15 0			
	— a ſet of china - - - -	2	10	0
	— 18 china plates - - — 2 3			
	— 3 diſhes - - - - - -		4	6
	— a mahogany tea-board - -	0	10	6
		7	4	6

	Nov. 26, 1783.			l	s	d
10	*Mr Thomas Grey Cr.*					
	By 42 ells of Holland, at 5s 6d - -					
	28					
4	*Sir Jeffery Slingſtone Cr.*					
	By caſh in full - - - -			36	1	4
	29					
10	*Samuel Simpſon Eſq. Dr.*					
		s	d			
	To 17¼lb Malaga raiſins - at	0	5½			
	— 19¾ — raiſins of the ſun —	0	6			
	— 17 — rice - - —	0	3½			
	— 8¼ — pepper - - —	1	6			
	— 13 oz cloves - - - —	0	9			
				2	4	10¼
	Dec. 1.					
2	*Mr James Wilſon, Schoolmaſter, Cr.*					
	By caſh in full - - - -			2	13	10
	3					
3	*Mr Alderman Alleman Dr.*					
	To a pipe of wine - - -			25	0	0
	6					
3	*William Winton Eſq. Cr.*					
	By 30 gal brandy, at 7s 6d - -					
	— caſh in full - - - -			9	0	0½
				20	11	0½
	8					
10	*Mr Thomas Hunter Dr.*					
	To 3 chaldrons of coals, 1l 15s -					
	10					
3	*Mr William Watſon Cr.*					
	By caſh in full - - - -			3	17	0
	12					
11	*Peter Thompſon of Worceſter, Eſq. Dr.*					
	To 5 buts of oil, wt 55 cwt 1 qr 20 lb groſs, tare 18 lb a cwt, at 24l 10s a ton of 236 gal, and 7½lb neat to the gallon - - - - -			72	2	4¾

Dec.

	Dec. 13, 1783.	l	s	d
9	*Mr Henry Foſter Cr.*			
	By caſh in full - - - -	2	6	$10\frac{1}{2}$
	15			
4	*Sir Thomas Lawſon Cr.*			
	By 3 c 2 qr 14 lb of tobacco, at 4l a cwt			
	18			
5	*Mrs. Shields Dr.*			
	To a lump of ſugar, wt $22\frac{3}{4}$ lb, at $8\frac{1}{2}$d			
	20			
10	*Samuel Simpſon Eſq. Cr.*			
	By caſh in full - - - -	3	13	$0\frac{1}{2}$
	22			
6	*Miſs Fanny Dawſon, Cr.*			
	By caſh in full - - -	4	4	0
	23			
11	*Mr Edward Young Dr.*			
	To 3 cwt 1 qr cheeſe, at 30s - -			
	24			
6	*Mr Roger Retail Cr.*			
	To a bill upon Thomas Williams Eſq for	50	0	0
5	*Mrs Shields Cr.*			
	By caſh in full - - -	1	1	$6\frac{3}{4}$
	29			
7	*Mrs March Cr.*			
	By caſh in full - - - -	18	0	11

Ledger A.

THE ALPHABET.

A *Alder. Ableman* 3 *Mr C. Anderſon* 6	B *Mr J. Baker* 7 *Mr R Barber* 8 *Balance* 11	C *Mr C. Compouud* 7
D *Capt J. Dixon* 5 *Miſs F. Dawſon* 6	E *Mr J. Elford* 1 *Mr S. Edwards* 8	F *Mr H. Foſter* 9
G *Mrs M. Gray* 9 *Mr T. Grey* 10	H *Mr T. Hunter* 10	I *D. Johnſon Eſq.* 4
K	L *Sir T. Lawſon* 4	M *Sir J. Moore* 2 *M. Maſterman* 1 *Mrs March* 7 *Mr M. Milton* 9
N *Mr N. Norton* 5	O	P
Q	R *G. Robſon Eſq.* 1 *Mr R. Retail* 6	S *L. Strawberry* 2, 8 *Sir J. Slingſtone* 4 *Mrs Shields* 5 *S. Simpſon Eſq.* 10
T *P. Thompſon* E*ſq*, 11	V	*W* *Mr J Wilſon* 2 *W. Winton Eſq.* 3 *Mr W. Watſon* 3
X	Y *Mr E. Young* 11	Z

Dr.

(1) Dr. *Mr James Elford, of Bath,* Cr.

1783		l	s	d	1783		l	s	d
Jan 1	To ſundries - -	3	12	6	Nov. 12	By a bill for - -	50	0	0
May 3	To ſundries - -	20	12	4		By account at fol. 1 ledger B	3	4	10
		53	4	10			53	4	10

Dr. *George Robſon Eſq. of York.* Cr.

1783		l	s	d	1783		l	s	d
Jan. 1	To ſundries - -	13	17	1					
Mar. 22	To ſundries - -	23	17	11½	Oct. 27	By caſh in full - -	37	15	0½
		37	15	0½					

Dr. *Mrs Mary Maſterman,* Cr.

1783		l	s	d	1783		l	s	d
Jan. 4	To ſundries - -	3	0	3½					
June 17	To ſundries - -	2	8	5¼	Apr. 24	By caſh in full - -	3	0	3½
Sept. 18	To caſh in full - -	1	18	2¾	June 21	By 40 yds of ſheeting, at 2s 2d	4	6	8
		7	6	11½			7	6	11½

(2) *Dr.* *Lady Strawberry,* *Cr.*

			l	s	d				l	s	d
1783						1783					
Jan.	9	To ſundries - -	16	2	7½	Sept.	22	By caſh received of the Steward	20	0	0
Apr.	12	To ſundries - -	11	17	9½			By account at fol. 8	24	15	10
Sept.	6	To 12¼ yds ſattin, at 10s 8d	6	10	8						
	12	To 11⅜ yds velvet, at 18s	10	4	9				44	15	10
			44	15	10						

Dr. *Sir Jonas Moore* *Cr.*

			l	s	d				l	s	d
1783						1783					
Jan.	20	To a ream of paper -	1	0	0	Feb.	27	By caſh in full - -	1	0	0

Dr *Mr James Wilſon Schoolmaſter* *Cr.*

			l	s	d				l	s	d
1783						1783					
Jan.	27	To ſundries - -	1	3	3	July	7	By caſh in full - -	1	3	8
Sept.	4	To ſundries - -	1	8	10	Dec.	1	By caſh in full - -	2	13	10
	12	To the univerſal penman	1	[illegible]	0				3	17	6
			3	17	6						

		l	s	d		l	s	d
12	To the univerſal penman	1	[illegible]	0				
		3	17	6		3	17	6

(3) *Dr* *Mr Alderman Ableman,* *Cr.*

1783			l	s	d	1783			l	s	d
Feb.	5	To ſundries - -	15	17	6	Aug.	7	By ſundries - -	15	17	6
Dec.	3	To a pipe of wine -	25	0	0			By account at fol 1 ledger B	25	0	0
			40	17	6				40	17	6

Dr *William Winton Eſq.* *Cr.*

1783			l	s	d	1783			l	s	d
Feb.	12	To ſundries - -	2	3	6½						
Aug.	1	To ſundries - -	18	7	6	Dec.	6	By ſundries in full -	20	11	0½
			20	11	0½						

Dr *Mr William Watſon* *Cr.*

1783			l	s	d	1783			l	s	d
Feb.	22	To ſundries - -	3	17	0	Dec.	10	By caſh in full - -	3	17	0

(4) Dr. *Sir Jeffery Slingſtone,* Cr.

1783			l	s	d	1783			l	s	d
Mar.	10	To ſundries - -	56	1	4	June	12	By a bank note - -	20	0	0
						Nov.	28	By caſh in full - -	36	1	4
									56	1	4

Dr. *Sir Thomas Lawſon,* Cr.

1783			l	s	d	1783			l	s	d
April	7	To ſundries - -	27	17	0	May	10	By a bill on Capt. James Dixon	10	0	0
May	10	To ſundries - -	8	12	2½	Dec.	15	By 3c 2qr 14lb tobacco, at 4l	14	10	0
								By account at fol. 1 ledger B	11	9	2½
			36	9	2½				36	9	2½

Dr. *David Johnſon Eſq.* Cr.

1783			l	s	d	1783			l	s	d
April	25	To ſundries - -	2	0	8½	Aug.	12	By caſh in part - -	50	0	0
May	20	To ſundries - -	17	7	10	Oct.	6	By caſh in full - -	4	1	6
June	28	To ſundries - -	34	12	11½				54	1	6
			54	1	6						

Dr. *Mr Nicholas Norton of Durham,* Cr.

1783			l	s	d	1783			l	s	d
May	14	To ſundries - -	23	15	4½	Sept.	9	By a bank note - -	20	0	0
								By account at fol 2 ledger B	3	15	4½
									23	15	4½

Dr. *Mrs Shields,* Cr.

1783						1783					
May	26	To ſundries - -	0	5	5½						
Dec.	18	To 22¼ lb ſugar, at 8½d	0	16	1¼						
			1	1	6¾	Dec.	24	By caſh in full - -	1	1	6¾

Dr. *Capt. James Dixon* Cr.

1783						1783					
June	3	To ſundries - -	30	5	5¾						
July	28	To ſundries - -	8	16	5						
Nov.	15	To caſh in full - -	3	1	10¼						
			42	3	9	Nov.	15	By 112½ ells of Holland, at 7s 6d	42	3	9

(6)		*Dr.* *Miſs Fanny Dawſon of Liverpool,*	l	s	d			*Cr.*	l	s	d
1783						1783					
July	3	To ſundries - -	4	4	0	Dec.	22	By caſh in full - -	4	4	0
		Dr. *Mr. Roger Retail,*				*of*		*Newcaſtle upon Tyne.* *Cr.*			
1783						1783					
						Dec.	24	By a bill - - -	50	0	0
July	10	To ſundries - -	83	5	9			By account at fol. 2 ledger B	33	5	9
									83	5	9
		Dr. *Mr. Charles*						*Anderſon,* *Cr.*			
1783						1783					
July	17	To ſundries - -	11	13	0	Aug.	16	By 5 pockets of hops at 28s.	12	0	0
	24	To ſundries - -	12	4	2	Sept.	24	By caſh in full - -	17	7	8
Aug.	18	To ſundries . .	5	10	6				29	7	8
			29	7	8						

(7)

Dr. *Mr Conrade Compound of Exeter,* *Cr.*

		l	s	d			l	s	d
1783									
Aug. 21	To ſundries - -	56	19	5		By account at fol. 2 ledger B	56	19	5

Dr. *Mr. John Baker,* *Cr.*

		l	s	d			l	s	d
1783					1783				
Aug. 26	To ſundries - -	16	7	0	Oct. 23	By caſh in part - -	10	0	0
						By account at fol. 3 ledger B	6	7	0
							16	7	0

Dr. *Mrs March of Cheſter,* *Cr.*

		l	s	d			l	s	d
1783									
Sept. 3	To 8 ſarcenet hoods, at 4s 3d	1	14	0					
17	To 17 India fans at 3s 10d	3	5	2	1783				
27	To ſundries - -	8	6	3					
Oct. 23	To ſundries - -	14	15	6	Dec. 6	By caſh in full - -	18	0	11
		18	0	11					

(8) *Dr.* *Mr Samuel Edwards,* *Cr.*

1783			l	s	d				l	s	d
Oct.	2	To 14lb flax at 1s -	0	14	0			By account at fol. 3 ledger B	1	14	6
	30	To ſundries - -	1	0	6						
			1	14	6						

Dr. *Mr R. Barber of Briſtol* *Cr.*

			l	s	d	1783			l	s	d
		To account at fol. 3 ledger B	18	15	0	Oct.	4	By 40 rms of foolſcap at 12s 6d	18	15	0

Dr. *Lady Strawberry* *Cr.*

1783			l	s	d	1783			l	s	d
		To account from fol. 2 -	24	15	10						
Oct.	6	To 27½ yds Holland at 5s 6d	7	11	3						
	13	To 40 yds Iriſh cloth at 3s 6d	6	13	4	Oct.	29	By caſh in full - -	39	0	5
			39	0	5						

(9) *Dr.* *Mr Matthew Milton, of Norwich,* *Cr.*

			l	s	d				l	s	d
1783						1783					
Oct.	10	To ſundries - -	14	2	5	Nov.	4	By ſundries - -	14	2	5

Dr. *Mr Henry Foster* *Cr.*

			l	s	d				l	s	d
1783						1783					
Oct.	1	To 2½ cwt of iron at 18s 9d	2	6	10½	Dec.	13	By caſh in full - -		6	10½

Dr. *Mrs Mary Gray* *Cr.*

			l	s	d				l	s	d
						1783					
		To account at fol 3 ledger B	9	8	6	Oct.	21	By 3 ps Iriſh cloth, qt 87 yds at 2s 2d - -	9	8	6

(10) *Dr.* *Samuel Simpſon Eſq.* *Cr.*

			l	s	d				l	s	d
1783						1783					
Nov.	7	To 32½lb of ſugar at 8½d	1	3	0¼						
	20	To 15½lb of currants at 4d	0	5	2						
	29	To ſundries - -	2	4	10¼						
			3	13	0½	Dec.	20	By caſh in full - -	3	13	0½

Dr. *Mr. Thomas Grey* *Cr.*

			l	s	d				l	s	d
1783						1783					
Nov.	22	To ſundries - -	7	4	6						
		To account at fol. 4 ledger B	4	6	6						
			11	11	0	Nov.	26	By 42 ells of Holland at 5s 6d	11	11	0

Dr. *Mr Thomas Hunter* *Cr.*

			l	s	d				l	s	d
1783											
Dec.	8	To chald coals at 1l 15s	5	5	0			By account at fol. 4 ledger B	5	5	0

Dec. 8	To chald coals at 1l 15s	5	5	0	By account at fol. 4 ledger B	5	5	0

(11) *Dr.* *Peter Thompson, of Worcester, Esq.* *Cr.*

1783		l	s	d		l	s	d
Dec. 12	To 5 butts of oil -	72	2	4¾	By account at fol. 4 ledger B	72	2	4¾

Dr. *Mr Edward Young,* *Cr.*

1783		l	s	d		l	s	d
Dec. 23	To 3 c 1 qr cheese, at 30s	4	17	6	By account at fol. 4 ledger B	4	17	6

Dr. *Balance* *Cr.*

1783		l	s	d		l	s	d
	To Mr J. Elford, due to me	3	4	10	By Mr R. Barber -	18	15	0
	To Mr Alderman Ableman	25	0	0	By Mrs Mary Gray -	9	8	6
	To Sir Thomas Lawson	11	19	2½	By Mr Thomas Grey -	4	6	6
	To Mr Nicholas Norton	3	15	1½		32	10	0
	To Mr Roger Retail	33	5	9				
	To Mr Conrade Compound	56	19	5				
	To Mr John Baker	6	7	0				
	To Mr Samuel Edwards	1	14	6				
	To Mr Thomas Hunter	5	5	0				
	To Peter Thompson Esq.	72	2	5¾				
	To Mr Edward Young	4	17	6				
		24	11	0¾				

Ledger B.

THE ALPHABET.

A *Alder. Ableman* 1	B *Mr J. Baker* 3 *Mr R. Barber* 3	C *Mr C. Compound* 2
D	E *Mr J. Elford* 1 *Mr S. Edwards* 3	F
G *Mrs M. Gray* 3 *Mr T. Grey* 4	H *Mr T. Hunter* 4	I
K	L *Sir T. Lawſon* 1	M
N *Mr N. Norton* 2	O	P
Q	R *Mr R. Retail* 2	S
T *P. Thompſon Eſq.* 4	V	W
X	Y *Mr. E. Young* 4	Z

(1)	*Dr.* *Mr. James Elford of Bath*	l	s	d	*Cr.*	l	s	d
1784	To account at fol. 1 ledger A	3	4	10				
	Dr. *Mr. Alderman Ableman,*				*Cr.*			
1784	To account at fol. 3 ledg. A	25	0	0				
	Dr. *Sir Thomas Lawson*				*Cr.*			
1784	To account at fol. 4 ledg. A	11	19	2½				

(2) **Dr.** *Mr. Nicholas Norton, of Durham,* **Cr.**

		l	s	d			l	s	d
1784	To account at fol. 5 ledger A	3	15	4½					

Dr. *Mr. Roger Retail of Newcaſtle upon Tyne,* *Cr.*

1784	To account at fol. 6 ledg. A	33	5	9					

Dr. *Mr. Conrade Compound of Exeter,* *Cr.*

1784	To account at fol. 7 ledg. A	56	9	5					

(3)

Dr. Mr. John Baker, Cr.

		l	s	d			l	s	d
1784	To account at fol. 7 ledger A	6	7	0					

Dr. Mr. Samuel Edwards, Cr.

		l	s	d			l	s	d
1784	To account at fol. 8 ledg. A	1	14	6					

Dr. Mr. R. Barber of Briſtol Cr.

		l	s	d			l	s	d
					1784	By account at fol. 8 ledger A	18	15	0

Dr. Mrs Mary Gray Cr.

		l	s	d			l	s	d
					1784	By account at fol. 9 ledger A	9	8	6

(10)

Dr. *Mr. Thomas Grey.* *Cr.*

		l	s	d			l	s	d
					1784	By account at fol. 10 ledger A	4	6	6

Dr. *Mr. Thomas Hunter,* *Cr.*

		l	s	d			l	s	d
1784	To account at fol. 10 ledger A	5	5	0					

Dr. *Peter Thompson of Worcester, Esq.* *Cr.*

		l	s	d			l	s	d
1784	To account at fol. 11 ledg. A	72	2	4¾					

Dr. *Mr. Edward Young* *Cr.*

		l	s	d			l	s	d
1784	To account at fol. 11 ledg. A	4	17	6					

BOOK-KEEPING BY DOUBLE ENTRY;

Or, according to the ITALIAN METHOD.

THIS method is ſaid to be by Double Entry, becauſe every article is twice entered in the Ledger, viz, on the Dr ſide of one account, and on the Cr ſide of another: and it is called the Italian Method becauſe of its having been invented in Italy.

In this method we generally conſider three books, viz. the Waſte Book, the Journal, and the Ledger; of each of which I ſhall give a ſhort account.

I. *Of the* WASTE BOOK.

The Waſte Book contains an Inventory of a perſon's effects and debts, with a diſtinct hiſtory of all his tranſactions in a way of trade, narrated in a plain, ſimple ſtile, and in order of time as they ſucceed one another.

The Waſte Book opens with an inventory of the perſon's effects and debts; which, when he firſt ſets out in trade is to be gathered from a ſurvey of the particulars that make up his real eſtate; but ever after it is to be collected from the balance of his old books, and carried to the new ones.

After this foundation is laid, all tranſactions in trade are ſet down ſimply as they happen, ſpecifying their dates, the names, &c of the perſons dealt with on truſt, the conditions of bargains, prices of goods, with the ſums of money, or any thing elſe that may be neceſſary to make the tranſactions eaſily underſtood; the manner of doing all which will appear from a view of the following ſpecimen of a Waſte Book.

II. *Of the* JOURNAL.

In the Journal, or Day Book, the tranſactions recorded in the Waſte Book are prepared to be carried to the ledger, by having their proper debtors and creditors aſcertained and pointed out.

It agrees with the Waſte Book in the form or manner of ruling, of dating, and in the order of ſucceſſion of the accounts according to their dates: but differs from it by having the debtors and creditors of all accounts ſpecified.

On the right hand margins of each folio or page, of the journal and waſte book, are ruled three columns for pounds, ſhillings, and pence; and on the left-hand margins, a column to receive the figures expreſſing the folios or pages where the ſame accounts are entered in the ſucceeding book, viz. in the waſte book margin are ſet the correſponding journal pages; and in the journal margin, the ledger pages.

III. *Of the* LEDGER.

In the ledger the ſeveral articles of each account are collected from the different pages of the journal through which they are ſcattered, and diſpoſed all in one place appointed for them; the debtor parts of the accounts being placed on one ſide of the folio, and the creditor parts of the ſame accounts on the other ſide of the ſame folio, and directly facing the former parts, by which diſpoſition all the tranſactions relating to each account appear at one view, and in one place.

From the other books then the ledger differs very conſiderably: each folio or page of it is divided in the middle, from top to bottom, into two equal ſpaces or ſides, the left-hand ſide receiving the debtor articles, and the right ſide the creditor articles of the accounts; being titled, at the top, *Dr* and *Cr* reſpectively; with the name or title of the account in the middle between, and upon a line with, the ſaid titles of *Dr* and *Cr*. The right-hand margin of each ſide is ruled into three columns for money, and one for the figures expreſſing the folios where the ſame articles ſtand on the other ſide of the folio of ſome other accounts; and on the left-hand margin is formed a column for the dates of the articles.

The ledger hath belonging to it an Index or Alphabet, in which the titles of the accounts are entered under their initial letters, with the figures of the pages in which they ſtand; by means of which they are readily found.

DIRECTIONS

DIRECTIONS *for the* LEARNER.

Having ruled your books according to the forms of the following ſpecimens, copy into your waſte book the firſt month's tranſactions, as they ſtand in the following waſte book, but omitting the left-hand marginal figures, which are to be inſerted according to the directions afterwards given. Then calculate every article to find if they be right, and to make yourſelf ready at calculations.

THESE articles are then to be entered, one by one, in the journal, and according to the journal form; and as ſoon as any article is entered in the journal, turn to the ſame article in the waſte book, and directly againſt it in the margin write the number of the folio where it ſtands in the journal. As to the form of entering in the journal, having written the date in the ſame manner as in the waſte book, obſerve the two following articles:

1. In a ſimple poſt, viz, in which only one debtor and one creditor are concerned, let the *Dr* be expreſly mentioned, then the *Cr*, and laſtly the ſum, all in one line; below which inſert the narrative, or reaſon of the entry, in one or more lines, in a full and particular manner, ſo that the whole of the tranſaction may eaſily be underſtood.

2. In a complex poſt, let the ſundry *Drs* and *Crs* be expreſſed in the firſt line by the word *Sundries*, and the reſt of the line filled up as in the former caſe. After which, let the ſeveral *Drs* or *Crs* be particularly mentioned, each in a line by itſelf, with their reſpective ſums adjoined to them; which are to be added up, and their total carried to the money columns. In this caſe obſerve alſo that, in mentioning the ſeveral *Drs* or *Crs*, the *Crs* take the word *To* before them, but the *Drs* are expreſſed ſimply, without any word prefixed.

FARTHER, in any entry, to know what to make *Dr*, and what *Cr*, obſerve the following rules:

1. Things received are *Drs*, and things delivered are *Crs*: conſequently, a thing received is *Dr* to the thing given for it.

2. A thing received on truſt, is *Dr* to the perſon of whom it is received.

3. The perſon to whom a thing is delivered on truſt, is *Dr* to the thing delivered.

4. In antecedent and ſubſequent caſes, parts that are naturally the reverſe of one another, are alſo oppoſed in reſpect of terms.

5. In caſes where perſonal and real *Drs* or *Crs* are wanting, the defect muſt be ſupplied by fictitious ones, according to your judgment.

6. In complex caſes, the ſeveral *Drs* or *Crs* are to be made out from the preceding rules jointly taken.

The fictitious *Drs* and *Crs* that are moſtly uſed, are 1. *Stock*, which is made *Cr* for the effects in the inventory, and *Dr* for the debts in it; 2. *Profit and Loſs*, which is made *Dr* for every ſum delivered for which nothing is expected as an equivalent, and for loſſes upon bargains or goods; and *Cr* for the contrary ſums, viz. for all gains upon goods, &c. 3. *Voyage to ſuch a place*, which is made *Dr* for things ſent as an adventure, and all expences upon them; and *Cr* for their nett proceeds. And ſeveral others, as may be ſeen in the following courſe of books.

HAVING finiſhed the journal entries for the month, you then proceed to poſt them into the ledger; by writing down every article twice, once on the *Dr* ſide, and once on the *Cr* ſide, viz, on the *Dr* ſide of that account which is *Dr*, and on the *Cr* ſide of that which is *Cr*; having firſt appointed ſpaces for theſe accounts by eſtimation large enough to contain all their articles, and titled them according to the deſcription of the ledger, and entered ſuch titles in their proper places in the alphabet immediately on writing them in the ledger. In entering the *Dr* ſide article, you write down the name of the *Cr*, preceded by the word *To*, and immediately after, in the line, the condition of the article, ſuch as price, quantity, &c. placing the whole ſum of money in the columns with the folio figure where the *Cr* ſtands, and prefixing to the whole its particular date: and in entering the *Cr* ſide article, write down the name of the *Dr*, preceded by the word *By*, writing the *Dr* folio number, and the date, money, &c. as before. This done, turn to the article in the journal and againſt it in the left hand margin write the *Dr* and *Cr* folio numbers, the former above the latter, with a line between, like a vulgar fraction: but when there are ſeveral *Drs* in a journal poſt, the *Cr* folio number need be but once entered, viz, under the loweſt *Dr* number; and when there are ſeveral *Crs*, write the *Dr* folio number above the upper *Cr* number only.

HAVING, in this manner, poſted all the journal entries for the month, in the ledger, write another month's accounts in the waſte book, from thence to the journal, and thence to the ledger, as before; after this go through the next month, and ſo on till the whole be finiſhed; tranſpoſing from one folio to another, in the ledger, ſuch accounts as happen to be too large to be contained in the ſpaces firſt aſſigned them, as is done with the *caſh* and *profit and loſs* accounts in the following ledger.

HAVING poſted all the accounts into the ledger, let them be balanced thus: let all accounts have their ſums of money on both ſides added up into two totals; but before theſe totals are ſet down, if they be unequal, let the ſides be made equal *(i. e. balanced)* by writing down on the lighter ſide as much as will make it equal the heavier, which ſum is generally charged *Dr to*, or *Cr by* either *Profit and Loſs* or *Balance*, theſe being the two accounts by which moſt others are balanced: all caſes, in which any thing is either gained or loſt, being balanced by means of *Profit and Loſs*; and all thoſe in which goods or any thing remains in your hands, or in which any thing is due to or by you, are cloſed by means of the *Balance* account, which is drawn out at the end of the ledger to receive all ſuch balances into; and the articles cloſed by *Profit and Loſs* being carried to the *Profit and Loſs* account. By theſe means all the gains and loſſes are collected into one place under the title of *Profit and Loſs*, and all the effects and debts into another, under the title of *Balance*; and therefore by cloſing or balancing theſe two general accounts by means of the ſtock account, and carrying the two equalling ſums to their proper ſides of the ſtock account, thoſe two ſides then added up, will be exactly equal to each other; otherwiſe the work is ſome where wrong, and muſt be examined till the error be rectified.—

Some accounts are cloſed by means of both *Profit and Loſs*, and *Balance*; for where any thing remains on hand, it is firſt ſet down on the left ſide by charging *Balance* with it at prime coſt, or the original value; after which the whole account muſt be equalled by *Profit and Loſs*.

THE books are then finiſhed, and in beginning a ſet of new ones, make out the inventory, in the new waſte book, from the balance of the ledger; for the inventory conſiſts of all the articles in the balance account of the old ledger.

Additional Obſervations.

INSTEAD of writing in the direction of the length of the page, after the manner of the ledger printed in this book, you may eaſily vary or alter the form of your ledger as you pleaſe, ruling the columns either acroſs the leaves or from top to bottom, and in this caſe placing the *Dr* articles on the left hand page, and the *Cr* articles facing them on the right hand page, if the leaves of your book are very narrow; but if their breadth will admit of it, place both *Drs* and *Crs* on one leaf, dividing it down the middle for that purpoſe.

Some teachers think it beſt to uſe only a waſte book and ledger; and thoſe who think ſo, may eaſily direct their pupils to poſt immediately into the ledger from the ſpecimen of waſte book here printed, and omit the journal. And of this opinion is an ingenious preceptor who ſent me the following collection of plain and particular rules or caſes, which may be uſed either with or without a journal.

Rules for making Tranſfers from a Day-Book to a Ledger, according to the Italian Method of Double Entry, adapted to the Specimen, in p. 184, *&c. By Mr.* A. CROCKER.

CASE I.

THE firſt tranſfer which is to be made, is of the ſtock, &c, which you have in hand, or whatever you owe, at the time you begin your accounts:—you muſt, therefore, make each article which you are poſſeſſed of, (expreſſing the prices per yard, cwt, &c, as well as the quantities) debtor to ſtock; the ſame of a perſon who owes money; and then make ſtock creditor by ſundries for the whole value, or for each article ſeparately for its value.—Alſo, you muſt make ſtock *Dr* to ſundries for what you owe; and each article which you owe for (expreſſing the prices and quantities, or perſon whom you owe any thing to) creditor by ſtock.

2. When you buy goods for ready money.—Make the goods, (expreſſing price and quantity) *Dr* to caſh; and caſh *Cr* by the goods, without expreſſing the price per yard or quantity.

3. When you buy goods on credit.—Goods (expreſſing price and quantity) *Dr* to the perſon bought of, and the perſon *Cr* by goods.

4. When you buy goods for part money and part credit.—Goods, (expreſſing price and quantity) *Dr* to ſundries; and caſh *Cr* by goods, for as much as was paid; and the perſon of whom bought, *Cr* alſo, by as much as remains due.—If part be paid by bill drawn by you, or ſome other perſon, you muſt make the perſon, on whom it is drawn, *Cr* by bill, expreſſing its value, and to whom payable.

5. When you buy goods and pay a bill on another for their value.—Goods (expreſſing price and quantity) *Dr* to the perſon on whom the bill is drawn; and the drawee *Cr* by bill on him, payable to the perſon on whom you bought goods.

6. When you buy a ſhare of a ſhip.—The ſhip (calling it by its name) *Dr* to caſh, (expreſſing your ſhare); and caſh *Cr* by ſhip, mentioning your ſhare and ſum paid.

7. When you take goods from another beyond the ſeas at your own riſk.—Goods (expreſſing price and quantity) *Dr* to voyage, mentioning from whence; and the voyage *Cr* by goods.

8. When you receive goods to ſell for another, and pay any charges for freight, &c.—The perſon's goods *Dr* to caſh (expreſſing for what); and Caſh *Cr* by freight on perſon's goods

9. When you ſell goods for ready money—Caſh *Dr* to goods, without mentioning price and quantity, and goods (expreſſing price and quantity) *Cr* by caſh.

10. When you ſell goods on credit.—The perſon, to whom ſold, *Dr* to goods, (the price and quantity of which may, or may not be expreſſed): and goods *Cr* by the perſon (expreſſing price and quantity.)

11. When you ſell goods, for part money and part credit, —Caſh *Dr* to goods, for the ſum received; and the buyer *Dr* to goods for the remainder; and goods, (expreſſing price and quantity) *Cr* by ſundries.

12. When you barter one kind of merchandize for other kinds of merchandize of equal value.—Make goods received *Dr* to goods delivered (expreſſing price and quantity); and goods delivered *Cr* by goods received, expreſſing alſo price and quantity.

13. When you diſpoſe of goods for part barter, and the remainder caſh.—Goods received *Dr* to goods delivered, for the value of goods received, and caſh alſo *Dr* for what you receive: and goods diſpoſed of *Cr* by ſundries.

14. When you ſell goods, and receive a bill on another perſon for payment.—The perſon on whom the bill is drawn, is made *Dr* for a bill received of the drawer, or indorſer, and goods (expreſſing price and quantity) *Cr* by bill, expreſſing on whom drawn.—Or bills receivable may be made *Dr*.

15. When you ſell goods, for part caſh, and the remainder a bill.—Caſh *Dr* to goods for what is paid in caſh; and bills receivable *Dr* to the other part; and goods, (expreſſing price and quantity) *Cr* by ſundries.

16. When you ſend goods to a factor, on your own account.—Voyage, or adventure *Dr* to goods, expreſſed either by the word ſundries, or each particular, as you will; and goods (expreſſed particularly, as well as the price and quantity) *Cr* by voyage or adventure: alſo caſh *Cr* by charges of cuſtom, &c.

17. When goods are ſent to a perſon, deſiring him to ſell them for you, or return them.—Suſpence account *Dr* to goods; and goods (expreſſing price and quantity) *Cr* by Suſpence account.

18. When you ſell for ready money any goods which were ſent to you to ſell for another.—Caſh *Dr* to the perſon's goods, and the perſon's goods *Cr* by caſh.

19. When you have ſold all, and charge the perſon commiſſion.—Perſon's goods *Dr* to profit and loſs for

your commiſſion, and profit and loſs *Cr* by the perſon's goods.

20. When you ſend goods to another perſon, beyond the ſeas, to ſell on your account.—Voyage to the place where ſent *Dr* to ſundries; and goods, under each title (expreſſing price and quantity) *Cr* by voyage to ſaid place; alſo caſh *Cr* by charges of cuſtoms, &c.

21. When you ſend a perſon's goods, to ſell, in partnerſhip with yourſelf.—The perſon's account in Co. *Dr* to goods, for your own ſhare, and perſon himſelf *Dr* to goods for his ſhare, expreſſing in both, price and quantity; and goods (expreſſing price and quantity) *Cr* by ſundries.

22. When you ſell goods in partnerſhip.—Caſh *Dr* to goods in company, mentioning the partner's name; and goods (expreſſing price and quantity) *Cr* by caſh.

23. When you ſell goods in partnerſhip on credit.—Perſon to whom ſold *Dr* to goods in company; and goods (expreſſing price and quantity) *Cr* by the perſon to whom ſold. If part be paid, and part remain due; the perſon and caſh are reſpectively *Dr* to goods in company, and the goods *Cr* by ſundries.

24. When goods in company, which have been ſold on credit, are paid for.—Caſh *Dr* to the perſon, and the perſon *Cr* by caſh.

25. When you pay money.—The perſon to whom it is paid *Dr* to caſh, (expreſſing whether in full or part); and caſh *Cr* by the perſon.

26. When you pay money, or diſcharge a debt by draft, or bill on ſome other perſon.—The perſon to whom the bill is delivered *Dr* for a bill (expreſſing on whom drawn, and the ſum); and the perſon on whom it is drawn *Cr* by bill payable to him to whom it is delivered, expreſſing the ſum.

27. When you lend money on bond, or other ſecurity. —The perſon to whom it is lent (expreſſing the ſum and ſecurity) *Dr* to caſh; and caſh *Cr* by the borrower, expreſſing the ſecurity.

28. When you pay ſervants' wages, houſe expences, &c. —Profit and loſs *Dr* to ſervants' wages, &c; and caſh *Cr* by ſervants' wages, &c.

29. When you receive money which was due to you.— Caſh *Dr* to the perſon who pays; and the perſon *Cr* mentioning whether in part or full.

30. When you receive a ſhare of the profits of a ſhip.—Caſh *Dr* to ſhip; and ſhip *Cr* by caſh for the ſhare of the profit.

31. When you receive intereſt for money lent.—Caſh *Dr* (expreſſing for what) to profit and loſs; and profit and loſs (expreſſing for what) *Cr* by caſh.

32. When you receive caſh for a bill before due.—Caſh *Dr* to bills receivable (expreſſing from whom); and bills receivable *Cr* by caſh, expreſſing likewiſe from whom.

33. When you have a legacy left you.—The executor *Dr* to profit and loſs; and profit and loſs *Cr* by executor.

34. When you pay charges on a voyage, to or from a place.—Voyage *Dr* to caſh (expreſſing for what); and caſh *Cr* by voyage.

35. When you receive a freight of ſhip.—Caſh *Dr* to ſhip; and ſhip *Cr* by caſh (mentioning for freight.

36. When you inſure a ſhip.—Ship *Dr* to caſh for inſurance; and Caſh *Cr* by ſhip for inſurance.

37. When you pay for repairs of a ſhip.—Ship *Dr* to caſh for repairs; and caſh *Cr* by ſhip for repairs.

38. When you pay charges on goods in company—Goods in company *Dr* to caſh; and caſh *Cr* by goods in company.

39. When you pay your partner his ſhare of neat proceeds, on goods, in partnerſhip ſold; deduct commiſſion and charges, and make perſon *Dr* to caſh, for his ſhare of neat gain on goods; and caſh *Cr* by perſon for his ſhare of neat gain on goods. Alſo, caſh *Dr* to goods for the whole, and goods *Cr* by caſh.

40. When you receive principal and intereſt of a bond, or other ſecurity.—Caſh *Dr* to perſon paying money (mentioning the ſecurity); and perſon *Cr* by caſh in full for principal, and profit and loſs for intereſt.

41. When a *Dr* fails, and makes a compoſition.—Caſh *Dr* for what you receive, and profit and loſs *Dr* for what you loſe by him; and the perſon himſelf *Cr* by ſundries in full.

42. When you draw a bill on a perſon.—Caſh *Dr* to drawee, and drawee *Cr* by caſh.

43. When you barter goods of different ſorts, for different ſorts of other goods.—Perſon with whom you barter, *Dr* for ſundries; and each ſort of goods delivered (expreſſing price and quantity) *Cr* by perſon; again each ſort of goods received (expreſſing price and quantity) *Dr* to perſon, of whom received; and the perſon *Cr* by ſundries.

44. When goods are bartered for other goods of equal value.—Goods received (expreſſing price and quantity) *Dr* to goods delivered (the price of which, may or may not be expreſſed) and goods delivered (expreſſing price and quantity) *Cr* by goods received, the price of which may or may not be expreſſed.

45. When returns are made of a ſuſpence account.—Goods returned (expreſſing price and quantity) *Dr* to ſuſpence account; and ſuſpence account *Cr* by goods returned, without expreſſing price and quantity.

46. When you receive advice of the ſale of goods, ſent on a voyage.—The perſon to whom the goods were conſigned, *Dr* to the voyage; and the voyage *Cr* by the ſame perſon.

47. When the perſon, to whom you made conſignment of any goods, makes a remittance in goods.—Voyage from the place *Dr* to the perſon, on account current; and the perſon *Cr* by voyage from the place, from whence he ſendeth the goods; but if the remittance be made by bills, the perſon's account current *Cr* by bills receivable; and bills receivable (mentioning on whom drawn) *Dr* to the perſon's account current.

48. When you receive goods conſigned to you—Goods, (expreſſing price and quantity of each ſort) *Dr* to voyage, &c; and voyage *Cr* by ſundries.

49. When you buy a ſhip in partnerſhip with another.—Ship (calling it by its name) *Dr* for your ſhare paid; and caſh *Cr* by ſhip.

50. When a perſon to whom you have delivered goods to ſell, in partnerſhip, has ſold them, and made return.—Caſh, or goods received *Dr* to the perſon; and the perſon *Cr* by caſh or goods.

51. When you ſend goods to a perſon according to his order.—Perſon to whom ſent *Dr* to goods, (expreſſing price and quantity) and goods (expreſſing price and quantity) *Cr* by the perſon.—If there be ſundry ſorts of goods ordered for, and ſuch as you have not got in your warehouſe, but procure them upon commiſſion, you may make the perſon's account current *Dr* to ſundries; and each article *Cr* by the perſon's account current.

All or moſt of theſe rules are applied in the following accounts.

THE WASTE BOOK.

London, *January* 1, 1789.

	An Inventory of the money, goods, and debts due to or by me A—— B——.		l	s	d
1	I have in ready money - -	5000 0 0			
	- 300 yards ſuperfine broad cloth, at 15s a yard	225 0 0			
	- 1200 yards linen, at 2s 6d a yard - -	150 0 0			
	- 800 pieces lead, weighing in all 44 ton, at 16l. a ton	704 0 0			
	- 25 puncheons rum, at 38l a puncheon -	950 0 0			
	- 12 hhds ſugar, containing 140 cwt, coſt -	304 6 0			
	- $\frac{3}{8}$ of the ſhip Endeavour	300 0 0			
	- William Johnſon owes me per note due the 1ſt of March - -	200 0 0			
	- James Gibſon per bond with intereſt at 5 per cent, from the 1ſt of November laſt -	500 0 0			
			8353	6	0
	I owe as follows:				
1	To Edward Young on demand	120 0 0			
	— Charles Wilſon Eſq. due the 12th inſtant -	87 4 0			
	— William Mercer, per account	65 10 6			
			272	14	6

			l	s	d
	Jan. 4, 1789.				
2	Bought 400 yds ſhalloon, at 1s 3d a yard		25	0	0
	7				
2	Paid Edward Young in full - -		120	0	0
	12				
2	Bought of Iſaac Onſlow 18 hhds Oporto wine, at 9l a hhd - - -		162	0	0
	17				
2	Paid to Charles Wilſon Eſq. in full -		87	4	0
2	Sold 150 yds linen, at 3s 2d a yard		23	15	0
	24				
2	Bought of Timothy Clarkſon 12 bags hops, qt. 40 cwt 2 qr at 46s a cwt, payable in 2 months - - - -		93	3	0
	30				
2	Bartered 5 puncheons rum, at 40l a puncheon, for 20 hhds Liſbon wine, at 10l a hhd - - - -		200	0	0
	Feb. 2				
2	Sold Thomas Draper 100 yds of broad cloth, at 18s a yard - - -		90	0	0
	6				
2	Shipped on board the Diligence, Captain Tempeſt, for Jamaica, the following goods, addreſſed to Abel Factor, on my account, viz.				
	800 yds linen, at 2s 6d a yard	100 0 0			
	200 — broad cloth, at 15s -	150 0 0			
	8 pieces of Holland, bought of Tho. Draper, at 19l a piece	152 0 0			
	Paid duty and fees, &c. -	21 4 2			
	Ditto for inſurance of 400l by Hazard and Co. at 5 per cent	20 0 0			
			443	4	2

Feb.

			l	s	d
	Feb. 8, 1789.				
3	Bought of Charles Wilſon Eſq. 1500 yds Scotch linen, at 2s 4d a yard				
	Paid him part in money - -	50 0 0			
	Given him a bill on Thomas Draper for - -	50 0 0			
	Reſt due in a month - -	75 0 0			
			175	0	0
	12				
3	Sold to Iſaac Onſlow 20 puncheons rum, at 44l a puncheon - -		880	0	0
	19				
3	Given William Mercer a bill upon Iſaac Onſlow for - - -		50	0	0
	23				
3	Bought of Thomas Draper 20 pieces Holland, at 18l a piece - -		360	0	0
	27				
3	Paid Thomas Draper in full -		472	0	0
	March 4				
3	Received of William Johnſon in full -		200	0	0
	7				
3	Lent James Dixon, upon bond at 5 per cent - - - -		1000	0	0
	9				
3	Sold Charles Wilſon Eſq. 20 tons lead, at 19l - - -		380	0	0
	14				
3	Sold David Robinſon 54 cwt ſugar, at 2l 16s				
	Received in part - -	100 0 0			
	Reſt due in 2 months - -	51 4 0			
			151	4	0

March

		l	s	d
	March 14, 1789			
4	Sold Eugene Arden 23 cwt 2 qr hops, at 50s a cwt for payment of which he has given me a bill on Timothy Clarkſon, payable at ſight. - -	58	15	0
	22			
4	Bought of George Wood 500 yds broad cloth, at 12s 6d, for which have given him a bill on Iſaac Onſlow -	312	10	0
	27			
4	Paid William Mercer in full -	15	10	6
	30			
4	Paid my ſervants their quarters wages, which together with the expences of my houſe and pocket, &c, for the laſt quarter, is in all - - -	93	4	10
	April 2			
4	Bartered 300 yds broad cloth, at 24s a yard, for 10 pieces Indian chintz, of the ſame value, at 21l a piece -	210	0	0
	5			
4	The owners of the Ship Endeavour have ſettled the accounts of the ſaid ſhip, and paid me my ſhare of neat gain from Michaelmas to Lady-day - -	94	13	8
	9			
4	Received of Iſaac Onſlow in full -	355	10	0
4	Bartered 15 tons lead, at 18l a ton, for the following goods of the ſame value, viz. 200lb tea, at 12s a lb - - 120 0 0 12 bales muſlin, at 12l 10s a bale 150 0 0	270	0	0
	15			
5	Paid Timothy Clarkſon in full -	34	8	0

April

			l	s	d
	April 24, 1789				
5	Bartered 155 hhds Liſbon wine, at 11l 10s a hhd, for				
	1 cwt cochineal, valued at -	120 0 0			
	The balance I have received in money - -	52 10 0			
			172	10	0
	May 1				
	Bartered with Thomas Young.				
	250 yds of linen, at 3s a yard	37 10 0			
5	And 9 tons lead, at 18l a ton	162 0 0			
			199	10	0
5	For 120 lb cinnamon, at 8s 4d a lb - - -	50 0 0			
	And 12 bags cotton, qt. 34 cwt 2 qr, at 3l 10s a cwt	120 15 0			
			170	15	0
	3				
5	Sold 40 cwt ſugar, at 58s a cwt, for which received a bill for 50l on Samuel Ward, due in 30 days, and 66l in caſh.		116	0	0
	8				
TJ No 1 2	Shipped on board the Speedwell, John Gibſon maſter, by order, and for account of, Timoleon Janſen, merchant in Leghorn, the following goods, marked, and numbered as per margin, viz.				
	200 yds my own broad cloth, at 14s - -	140 0 0			
5	10 ton lead, preſently bought for ready money, at 16l 4s	162 0 0			
	16 pieces drugget, at 7l 7s, bought of James Horton	117 2 0			
	Paid cuſtom and other charges till on board -	12 8 7			
	Paid Hazard and Co. for inſuring 400l on the whole	10 10 0			
	My commiſſion on ditto, at 2½ per cent - -	11 1 3			
			453	11	0

		l	s	d
	May 13, 1789			
	Sent William Lawſon, at Briſtol,			
6	1000 yds Scotch linen, at 2s 6d 125 0 0			
	And 400 yds ſhalloon, at 1s 5d 28 6 8			
		153	6	8
	Deſiring him to take them at the above prices, or return them on my charges.			
	17			
6	Received of James Gibſon for a half year's intereſt of 500l, due the 1ſt inſt.	12	10	0
	25			
6	Drawn my bill on Timoleon Janſen, in Leghorn, for 1200 piaſtres, at 50d each, payable to James Johnſton, or order, for value here received - -	250	0	0
	June 3			
6	Received of David Robinſon in full	51	4	0
	7			
6	Received of Sam. Ward for the bill on him	50	0	0
6	Sold William Johnſon, 12 pieces Holland, at 20l a piece - -	240	0	0
	19			
6	Received 500 yds Scotch linen, returned by William Lawſon, he keeping the other 500 yds and the ſhalloon -	62	10	0
	28			
7	Received from Abel Factor, of Jamaica, ſales of 800 yds linen, 200 yds broad cloth, and 8 pieces of Holland, by the Diligence, Capt. Tempeſt, on my account; neat proceeds amounting to 794l 13s 4d currency, exchange at 140 per cent.	567	12	4

June

		l	s	d
	June 23, 1789.			
7	Received from Abel Factor, of Jamaica, invoice of 8 puncheons rum, 8 barrels indigo, and 6 hogſheads ſugar, ſhipped by him on board the Diligence, on my account and riſk, amounting to 487l 16s 10d currency, exchange at 40 per cent	348	9	2
	July. 4			
7	My uncle Humphery Adams is dead, and hath left me a legacy, payable by his executor James Gibſon, the ſum is	300	0	0
	8			
7	Paid houſe and ſhop rent, and ſervants wages, which together with houſe-keeping and other expences till Midſummer, amount in all to - -	130	0	0
	13			
7	Drawn my bill on Abel Factor, of Jamaica, payable to Edward Young, or order of value due by ditto Young at 14 days	219	3	2½
	23			
7	Ship Diligence is arrived ſafe with my goods from Jamaica; freight, duty, and other charges paid here, amount to	83	4	8
8	Sold David Robinſon my 6 hogſheads ſugar on the key Received in part - - 70 0 0 Reſt due in 6 months - 70 0 0	140	0	0
	25			
8	Brought into my warehouſe My 7 puncheons rum, at 23l 161 0 0 And 8 barrels indigo, containing 125 lb per barrel, at 2s 3d per lb - - 112 10 0	273	10	0

July

					l	s	d
	July 30, 1789.						
8	Received of Edward Young in full for my bill on Abel Factor - -				219	3	2½
	Auguſt 2						
8	Received from on board the Dolphin, James Scot, maſter, the following goods, to ſell for Frederick Van Dyke, merchant in Amſterdam, viz. 5 butts currants and 12 caſks raiſins.						
	Paid cuſtom, frieght, wharfage, porterage, &c - - -				12	14	6
	7						
8	Received of William Lawſon in part				50	0	0
	10						
8	Sold Frederick Van Dyke's 5 butts currants, qt 84 cwt at 1l 12s per cwt -				134	8	0
	14						
9	Sold to James Dixon, for account of Frederick Van Dyke, his 12 caſks raiſins, qt 76 cwt at 2l per cwt -				152	0	0
	17						
9	Paid ſtorage, brokerage, &c on Van Dyke's goods - - -				2	0	6
9	My commiſſion on 301l at 2½ per cent comes to - - -				7	10	6
	26						
9	Shipped on board the Dolphin, James Scot, maſter, the following goods, by order of Frederick Van Dyke.						
	My 46 cwt ſugar, at 56s -	128	16	0			
	6 hhds tobacco, for which I have paid -	40	6	4			
	Paid cuſtom and other charges	8	12	3			
	My commiſſion at 2½ per cent	4	8	10			
					182	3	5

September

			l	s	d
	September 2, 1789				
9	Remitted Frederick Van Dyke a bill of 866 guilders, drawn by Thomas Young on James Jolliffe, merchant, in Amſterdam, value paid here, exchange at 35^s 6d - - -		81	6	3½
	9				
9	Received of James Dixon 6 months intereſt of 1000l - - -		25	0	0
	20				
10	Shipped on board the Shark, Capt. Blunt, for Hamburgh, the following goods addreſſed to James Conyers, on my account, viz.				
	My 34 cwt 2 qr cotton, at 3^l 10s - -	120 15 0			
	Alſo my 10 pieces India chintz, at 21l - -	210 0 0			
	Paid cuſtom and other charges	24 7 8			
			355	2	8
	24				
10	Sold James Dixon 12 hhds Oporto wine, at 10l a hhd, for payment of which he hath given me a bill on William Jones, due at 3 days - - -		120	0	0
	30				
10	Received as my ſhare gained by the ſhip Endeavour ſince Lady-day -		58	13	2
	October 4				
10	Received of William Jones, in full of J. Dixon's bill - -		120	0	0
	8				
10	Delivered to William Anderſon 12 bales muſlin, at 12l 10s a bale, to ſell for our account, each one half -		150	0	0

	October 8, 1789	l	s	d
10	The expence of my houſe, ſhop, ſervants, &c till Michaelmas is -	110	3	4
	12			
10	Received of William Anderſon, in full for his half ſhare of 12 bales muſlin -	75	0	0
	14			
11	Paid William Anderſon, for my half ſhare 12 hhds tobacco, which he has bought on our joint account - -	72	0	0
11	Bought of Adam Ainſley, for account of Samuel Edwards and myſelf in company, each a half, 14 hhds tobacco, at 5l 10s - Due on demand	77	0	0
	16			
11	Paid the owners of the ſhip Swallow, each one-half of ſaid ſhip, bought of them in company with Samuel Edwards -	920	0	0
	21			
11	William Anderſon having diſpoſed of our muſlin and tobacco, hath paid me my ſhare of neat proceeds, as follows, viz. 15 pieces kerſeys, at 6l - 90 0 0 A bill on George Drake for 50 0 0 The reſt in money, viz - 53 7 4	193	7	4
	24			
11	Received of Nicholſon and Company, affreighters of the ſhip Swallow, for one month's freight, advanced by them, on account of her voyage to Liſbon -	25	0	0
11	Paid Premium of 900l inſured on the ſhip Swallow, for her voyage to Liſbon, at $1\frac{1}{2}$ per cent - - -	13	0	0

			l	s	d
	October 25, 1789				
12	Paid Hugh Adams, for repairs of the ſhip Swallow, as per his account -		14	6	4
12	Sold our 14 hhds tobacco at 7l -		98	0	0
	26				
12	Paid carriage and other charges on our tobacco - - -		2	7	3
	28				
12	Paid Adam Ainſley in full for tobacco		77	0	0
	30				
12	My commiſſion on the purchaſe, ſales, and charges on our tobacco at 2 per cent, is		3	10	11
12	Paid Samuel Edwards, in full of his half ſhare of neat proceeds on tobacco		7	10	11
	November 2				
12	Shipped on board the Active, Capt. Brown, the following goods in company with Edmund Ellis and Nicholas Norton, each ⅓ to the addreſs of Peter Thornton of Liſbon, viz.				
	Furniſhed by Edm. Ellis,				
	50 yds broad cloth at 15	487 10 0			
	Furniſhed by Nich. Norton,				
	120 pieces flannel at 36s	216 0 0			
	Furniſhed by me,				
	15 pieces kerſeys at 6l a piece	90 0 0			
	8 pieces Holland at 18l	144 0 0			
	Duty and fees of entry, &c. paid by me - -	28 10 0			
	Paid alſo premium of inſuring 900l on ſaid goods, per Hazard and Co, at 2 per cent	18 0 0			
			984	0	0

November 6

			l	s	d
	November 4, 1739.				
13	Nicholas Norton and I have paid Edmund Ellis, on account of the above cargo, our proportions to make our ſhares equal, viz.				
	Paid by Nicholas Norton	112 0 0			
	Paid by me - -	47 10 0			
			159	10	0
13	Received of James Gibſon in full of his bond with the intereſt due the 1ſt inſt.				
	The principal is - -	500 0 0			
	The intereſt comes to -	12 10 0			
			512	10	0
	6				
13	James Dixon having failed, I have compounded his debt at 15s per l, viz.				
	Received for myſelf -	750 0 0			
	Received F. V. Dyke -	114 0 0			
	Allowed for myſelf - -	250 0 0			
	Ditto for F. V. Dyke -	38 0 0			
			1152	0	0
	8				
13	Bought of George Emerſon, in company with Edmund Ellis and Nich. Norton, 18 pipes Madeira, at 25l -		450	0	0
	9				
13	Received of William Lawſon in full		40	16	8
	11				
13	We have paid George Emerſon in full for our Madeira as follows, viz				
	Edmund Ellis has given him goods to the value of	94 0 0			
	Nicholas Norton hath counted with him for -	170 0 0			
	I have paid him the reſt in money	186 0 0			
			450	0	0

		l	s	d
	November 11, 1789.			
13	Edmund Ellis hath evened our accounts by paying To Nich. Norton - 20 0 0 And to me - - 36 0 0	56	0	0
	12			
14	Sold William Wright 4 pipes madeira in co with Edmund Ellis and Nicholas Norton, at 27l - - -	108	0	0
	13			
14	Sold James Thompſon 3 pipes of our madeira, at 28l Received in part - - 34 0 0 Reſt due in two days - - 50 0 0	84	0	0
	15			
14	Bartered 11 pipes of our madeira, at 28l, for 14 pipes canary wine, at 22l	308	0	0
	16			
14	Received of William Wright in full for madeira - - -	108	0	0
	19			
14	Paid James Horton in full for Timoleon Janſen's druggets - -	117	12	0
	23			
14	Compounded with James Thompſon, who has failed, as follows, viz Compoſition received - 30 0 0 Remainder allowed him - 20 0 0	5	0	0
	27			
14	Sold Thomas Young my cwt cochineal for - - - -	130	0	0

November

		l	s	d
	November 29, 1789			
14	Sold 2 pipes of our canary, at 25l	50	0	0
	December 5			
14	Divided between E. Ellis, N. Norton, and myſelf, our remaining 12 pipes of canary, at 22l - - -	264	0	0
	6			
15	Received advice from James Conyers of Hamburgh, that he hath received and diſpoſed of my goods, the neat proceeds, as per account of ſales, amounting to 676l 15s 6d Flemiſh, exchange 34s 6d, makes ſterling - -	392	6	8
	14			
15	Sold Timothy Clarkſon 500 yards Scotch linen, at 2s 10d - -	70	16	8
	18			
15	James Conyers hath remitted to me in full, exchange at 34s 2d, in bills as follows, viz One on Charles Cooke for 300 0 0 One on William Webſter for 96 3 2½	396	3	2½
	24			
15	Received of Nicholſon and Co. in full for freight of ſhip's Swallow's voyage to and from Liſbon - - -	25	0	0
	26			
15	Sold Nicholſon and Co our ſhip Swallow, payable in 3 months - -	100	0	0
	28			
15	Expences, houſe, ſervants, ſhop, &c. till Chriſtmas, amount to -	91	2	8

THE

JOURNAL.

LONDON, *January* 1, 1789.

			l	s	l
	Sundries Drs to Stock £8333 6 0				
1	Caſh, for ready money -	5000 0 0			
2	Broad Cloth, for 500 yards at 15s a yard - -	225 0 0			
2	Linen, for 1200 yards at 2s 6d a yard - -	150 0 0			
2	Lead, for 800 pieces, wt 44 tons, at 16l a ton -	704 0 0			
3	Rum, for 25 puncheons, at 38l a puncheon -	950 0 0			
3	Sugar, for 12 hhds, qt 140 cw	304 6 0			
3	Ship Endeavour, for $\frac{3}{8}$ coſt	300 0 0			
4	William Johnſon, per note due the 1ſt March -	200 0 0			
4/1	James Gibſon, per bond bearing intereſt at 5 per cent, from the 1ſt of November -	500 0 0			
		———	8333	6	0
	Stock Dr to Sundries £272 14 6				
1/4	To Mr. Edmund Young on demand - -	120 0 0			
4	To Charles Wilſon Eſq, the 12th inſtant - -	87 4 0			
5	To William Mercer, per account -	65 10 6			
		———	272	14	6

Jan.

		l	s	d
	Jan. 4, 1789			
5/1	*Shalloon Dr to Cash £25 0 0* For 400 yards at 1s 3d a yard -	25	0	0
	7			
4/1	*Edward Young Dr to Cash £120 0 0* Paid him in full - -	120	0	0
	12			
5/5	*Oporto Wine Dr to Isaac Onslow £162 0 0* For 18 hhds at 9l per hhd -	162	0	0
	17			
4/1	*Charles Wilson Esq. Dr to Cash £87 4 0* Paid him in full - -	87	4	0
1/2	*Cash Dr to Linen £23 15 0* For 150 yards at 3s 2d a yard -	23	15	0
	24			
6/6	*Hops Dr to Timothy Clarkson £93 3 0* For 12 bags, qt 40 cwt 2 qr at 46s a cwt payable in 2 months - -	93	3	0
	30			
6/3	*Lisbon Wine Dr to Rum £200 0 0* For 20 hhds at 10l a hhd received in barter for 5 puncheons, at 40l a puncheon	200	0	0
	Feb. 2			
7/2	*Thomas Draper Dr to Broad Cloth £90* For 100 yards at 18s a yard -	90	0	0
	6			
7	*Voyage to Jamaica Dr to Sundries £443.4 2*			
2	To Linen, 800 yards at 2s 6d 100 0 0			
2	To broad cloth, 200 yards at 15s 150 0 0			
7	To Thomas Draper, for 8 pieces Holland, at 19l - 152 0 0			
1	To Cash, for duty, insurance &c 41 4 2	443	4	2

			l	s	d
	Feb. 8, 1789				
	Scotch Linen Dr to Sundries £175 0 0				
7	To Cash in part for 1500 yards				
1	at 2s 4d - -	50 0 0			
7	To Tho. Draper, for a bill on him	50 0 0			
4	To Charles Wilson Esq, for the rest	75 0 0			
			175	0	0
	12				
	Isaac Onslow Dr to Rum £880 0 0				
5	For 20 puncheons at 44l -		880	0	0
3					
	19				
	William Mercer Dr to Isaac Onslow £50				
5	For a bill given to him for -		50	0	0
5					
	23				
	Holland Dr to Thomas Draper £360 0 0				
8	For 20 pieces at 18l - -		360	0	0
7					
	27				
	Thomas Draper Dr to Cash £472 0 0				
7	Paid him in full - -		472	0	0
1					
	March 4				
	Cash Dr to William Johnson £200 0 0				
1	Received of him in full - -		200	0	0
4					
	7				
	James Dixon Dr to Cash £1000 0 0				
8	Lent him on bond at 5 per cent -		1000	0	0
1					
	9				
	Charles Wilson Esq. Dr to Land £380				
4	For 20 tons at 19l a ton - -		380	0	0
2					
	14				
	Sundries Dr to Sugar £151 4 0				
1	Cash in part for 54 cwt at 56s	100 0 0			
8	David Robinson, rest in 2 months	51 4 0			
3			151	0	0

March

		l	s	d
	March 14, 1789			
6/6	*Timothy Clarkſon Dr to Hops £58 15 0* For 23 cwt 2 qr at 50s, ſold to Eugene Arden, for which have received a bill on T. Clarkſon, due at ſight.	58	15	0
	22			
2/5	*Broad Cloth Dr to Iſaac Onſlow £312 10* For 500 yds at 12s 6d, bought of Geo. Wood, for which have given him a bill on I. Onſlow - - -	312	10	0
	27			
5/1	*William Mercer Dr to Caſh £15 10 6* Paid him in full - -	15	10	6
	30			
9/1	*Profit and Loſs Dr to Caſh £93 4 10* For ſervants wages with houſe and pocket expences during the laſt quarter	93	4	10
	April 2			
10/2	*India Chintz Dr to Broad Cloth £210* Bartered 300 yds at 14s, for 10 pieces at 21l - - - -	210	0	0
	5			
1/3	*Caſh Dr to Ship Endeavour £94 13 8* For my ſhare of the neat gain from Michaelmas to Lady-day - -	94	13	8
	9			
1/5	*Caſh Dr to Iſaac Onſlow £355 10 0* Received of him in full - -	355	10	0
	Sundries Drs to Lead £270 0 0			
10	Tea 200lb at 12s a lb - 120 0 0			
10	Muſlin, 12 bales at 12l 10s a bale 150 0 0			
		270	0	0
2	Received in barter for 15 tons, at 18l a ton			

			l	s	d
	April 15, 1789				
6/1	*Timothy Clarkſon Dr to Caſh* £34 8 0				
	Paid him in full - -		34	8	0
	24				
	Sundries Drs to Liſbon Wine £172 10 0				
10	Cochineal, 1 cwt valued at	120 0 0			
1/6	Caſh, received in money -	52 10 0	172	10	0
	Received in barter for 15 hhds at 11l 10s a hhd.				
	May 1				
11	*Thomas Young Dr to Sundries* £199 10 0				
2	To Linen, 250 yds at 3s -	37 10 0			
2	To Lead, 9 tons, at 18l -	162 0 0	199	10	0
	Delivered in barter.				
	Sundries Drs to Thomas Young £170 15 0				
11	Cinnamon, 120lb at 8s 4d	50 0 0			
11/11	Cotton, 34 cwt 2 qr at 3l 10s	120 15 0	170	15	0
	Received in barter.				
	3				
	Sundries Drs to Sugar £116 0 0				
1	Caſh, in part for 40 cwt at 48s	66 0 0			
11/3	Bills Receivable, one on Samuel Ward, for the reſt, payable in 30 days - -	50 0 0	116	0	0
	8				
	Timoleon Janſen's Account Current Dr to Sundries £453 11 10				
12/2	To Broad Cloth, 200 yds at 14s - -	140 0 0			
1	To Caſh, for 10 tons lead, at 16s 4d with charges	184 18 7			
12	To James Horton, for 16 ps druggets, at 7l 7s	117 12 0			
9	Profit and Loſs, for my Commiſſion - -	11 1 3	453	11	10

			l	s	d
	May 13, 1789				
	Suſpence Account Dr to Sundries £153 6 8				
12/7	To Scotch linen, 1000 yds at 2s 6d	125 0 0			
8	To ſhalloon, 400 yds at 1s 5d	28 6 8	153	6	8
	Sent to William Lawſon, deſiring him to take them at the above prices, or return them.				
	17				
	Caſh Dr to Profit and Loſs £12 10 0				
1/9	For half year's intereſt of 500l of James Gibſon - - -		12	10	0
	25				
	Caſh Dr to Timoleon Janſen's Account Current £250 0 0				
1/12	Drawn my bill on him for 1200 piaſtres at 50d each, payable to James Johnſon or order, value received -		250	0	0
	June 3				
	Caſh Dr to David Robinſon £51 4 0				
1/8	Received of him in full -		51	4	0
	7				
	Caſh Dr to Bills Receivable £50 0 0				
1/11	Received of Samuel Ward for the bill on him - - -		50	0	0
	William Johnſon Dr to Holland £240				
4/8	For 12 pieces, at 20l a piece -		240	0	0
	13				
	Sundries Dr to Suſpence Account £153 6 8				
12	William Lawſon, for 500 yds Scotch linen and 400 yds ſhalloon, kept -	90 16 8			
7/12	Scotch linen, 500 yds returned	62 10 0	153	6	8

		l	s	d
	June 28, 1789.			
13/7	*Abel Factor my Account Current Dr to Voyage to Jamaica* £567 12 4½ For neat proceeds of 500 yds linen, 200 yds broad cloth, and 8 pieces Holland, amounting, per ſales, to 794l 13s 4d currency, exchange at 140 per cent	567	12	4½
13/13	*Voyage from Jamaica Dr to Abel Factor my Account Current* £348 9 2 For coſt and charges of 7 punches rum 8 barrels indigo, and 6 hogſheads ſugar, amounting, per invoice, to 487l 16s 10d currency, exchange at 140 per cent.	348	9	2
	July. 4			
4/9	*James Gibſon Dr to Profit and Loſs* £300 0 0 For a legacy left me by my uncle Humphrey Adams, and payable by ditto Gibſon his executor - -	300	0	0
	8			
9/1	*Profit and Loſs Dr to Caſh* £130 0 0 For houſe and ſhop expences, and ſervants wages till Midſummer -	130	0	0
	13			
4/13	*Edward Young Dr to Abel Factor my Account Current* £219 3 2½ For my bill on him, payable to ditto Young, value due by him, at 14 days	219	3	2½
	23			
13/1	*Voyage from Jamaica Dr to Caſh* £83 4 8 For freight, duty, and other charges paid here - - - -	83	4	8

July

			l	s	d
	July 23, 1789.				
	Sundries Dr to Voyage from Jamaica £140 0 0				
1	Caſh in part for my 6 hhds ſugar	70 0 0			
8	David Robinſon, for the reſt at 6 months -	70 0 0			
13			140	0	0
	25				
	Sundries Drs to Voyage from Jamaica £273 10 0				
3	Rum, 7 puncheons at 23l	161 0 0			
13	Indigo, 8 barrels, qt 125lb each, at 2s 3d -	112 10 0			
13			273	10	0
	Brought into my warehouſe.				
	30				
	Caſh Dr to Edward Young £219 3 2½				
14 4	Received in full for my bill on Abel Factor		219	3	2½
	Auguſt 2				
	Fred. Van Dyke's Account of Goods Dr to Caſh £12 14 6d				
10 14	For cuſtom, freight, wharfage, porterage &c, paid here on 5 buts currants, and 12 caſks raiſins, ſent me here by the Dolphin, James Scot maſter, to ſell for him - - -		12	14	6
	7				
	Caſh Dr to W. Lawſon £50 0 0				
14 12	Received in part - -		50	0	0
	10				
	Caſh Dr to Fred. Van Dyke's Account of Goods £134 8 0				
14 15	For his 5 butts currants, qt 84 cwt at 1l 12s - - -		134	8	0

Auguſt

			l	s	d
	Auguſt 14, 1789.				
8/15	*James Dixon Dr to Fred. Van Dyke's Account of Goods £152 0 0*				
	For his 12 caſks raiſins, qt. 76 cwt at 2l		152	0	0
	17				
15/14	*Fred. Van Dyke's Account of Goods Dr to Caſh £2 0 6*				
	For ſtorage, brokerage, &c, paid		2	0	6
	Fred. Van Dyke's Account of Goods Dr to Profit and Loſs £7 10 6				
15/9	For my commiſſion on 326l at 2½ per cent - - - - -		7	10	6
	26				
15	*Fred. Van Dyke's Account Current Dr to Sundries £182 3 5*				
3	To ſugar, 46 cwt at 56s	128 16 0			
14	To caſh for 6 hhds tobacco, with cuſtom, &c,	48 18 7			
9	To Profit and Loſs, for my commiſſion -	4 8 10			
			18	3	5
	September 2				
15/14	*Fred. Van Dyke's Accoount Current Dr to Caſh £81 6 3½*				
	For a bill ſent him of 866 guilders, exchange at 35s 6d, drawn by Thomas Younge on James Jolliffe of Amſterdam -		8	6	3½
	9				
14/9	*Caſh Dr to Profit and Loſs £25 0 0*				
	For 6 months intereſt of 1000l of James Dixon - - -		2	0	0

			l	s	d
	September 20, 1789				
	Voyage to Hamburgh Dr to Sundries £355 2 8				
15 11	To Cotton, 34 cwt 2 qr at 3l 10s - -	120 15 0			
10	To Indian Chintz, 10 pieces at 21l - -	210 0 0			
14	To caſh, for cuſtom, &c	24 7 8	355	2	8
	24				
	Bills receivable Dr to Oporto Wine £120				
11 5	For 12 hhds at 10l, for payment have taken a bill on William Jones, due in 3 days		120	0	0
	30				
14 3	*Coſh Dr to Ship Endeavour* £58 13 2 For my ſhare of the gain ſince Lady-day		58	13	2
	October 4				
14 11	*Caſh Dr to Bills receivable* £120 0 0 For J. Dixon's bill on William Jones		120	0	0
	8				
	Sundries Drs to Muſlin £150 0 0				
16	William Anderſon my account in Co for my half ſhare of 12 bales at 12l 10s -	75 0 0			
16 10	William Anderſon, for his ſhare	75 0 0	150	0	0
9 14	*Profit and Loſs Dr to Caſh* £110 3 4 For houſe expences, &c, till Machaelmas		110	3	4
	12				
14 16	*Caſh Dr to William Anderſon* £75 0 0 Received for his ſhare of 12 bales muſlin		75	0	0

			l	s	d
	October 14, 1789				
	William Anderſon, my Account in Co. Dr to Caſh £72 0 0				
16 14	For my ſhare of 12 hhds tobacco paid him		72	0	0
	Tobacco in Co. with Samuel Edwards Dr to Adam Ainſley £77 0 0				
16 17	For 14 hhds at 5l 10s, bought of him in co. due on demand - -		77	0	0
	16				
17	*Ship Swallow in Co. with Samuel Edwards Dr to Sundries £920 0 0*				
14	To Caſh, for my half ſhare paid	460 0 0			
17	To Sam. Edwards, for his half	460 0 0			
			920	0	0
	21				
	Sundries Drs to William Anderſon my Account in Co. £193 7 4				
18	Kerſeys, 15 pieces at 6l -	90 0 0			
11	Bills receivable, 1 on Geo, Drake	50 0 0			
14 16	Caſh, received in money, being in full for my ſhare neat proceeds on muſlin and tobacco	53 7 4			
			193	7	4
	24				
	Caſh Dr to Ship Swallow in Co. with Sam. Edwards £25 0 0				
14 17	For 1 month's freight received of Nicholſon and Co. affreighters of ſaid ſhip on a voyage to Liſbon - -		25	0	0
	Ship Swallow in Co. with Sam. Edwards Dr to Caſh £13 10				
17 14	For the inſurance of 900l paid on her voyage to Liſbon, at 4 per cent -		13	1	0

		l	s	d
	——— October 25, 1789 ———			
17/14	*Ship Swallow in Co. with Samuel Edwards Dr to Caſh £14 6 4* For the repairs paid to Hugh Adams	14	6	4
14/16	*Caſh Dr to Tobacco in Co with Sam. Edwards £98 0 0* For our 14 hhds at 7l - -	98	0	0
16/14	*Tobacco in Co. with Sam. Edwards Dr to Caſh £2 7 3* For carriage, &c paid by me -	2	7	3
	——— 28 ———			
17/14	*Adam Ainſley Dr to Caſh £77 0 0* Paid him in full for tobacco -	77	0	0
	——— 30 ———			
16/19	*Tobacco in Co. with Sam. Edwards Dr to Profit and Loſs £3 10 11* For my commiſſion at 2 per cent	3	10	11
17/14	*Sam. Edwards Dr to Caſh £7 10 11* Paid him his ſhare neat proceeds on our tobacco - - -	7	10	11
	——— November 2 ———			
18	*Voyage to Liſbon per the Active Capt. Brown, in Co. with Edm. Ellis and Nich. Norton Dr to Sundries £984*			
18	To Edm. Ellis, for 650 yards broad cloth at 15s - 487 10 0			
19	To Nich. Norton, for 120 ps flannel at 36s - 216 0 0			
18	To Kerſeys, 15 pieces at 6l 90 0 0			
8	To Holland, 8 pieces at 18l 144 0 0			
14	To Caſh, for inſurance, duty, &c - - 46 10 0	984	0	0

Addreſſed to Peter Thornton.

			l	s	d
	——November 4, 1789——				
18	*Edm. Ellis Dr to Sundries* £159 10 0				
19	To Nich. Norton, paid by him	112 0 0			
14	To Caſh, paid by me -	47 10 0			
			159	10	0
14	*Caſh Dr to Sundries* £512 10 0				
4	To James Gibſon, for the principal - -	500 0 0			
9	To profit and loſs, for intereſt	12 10 0			
			512	10	0
	———— 6 ————				
	Sundries Dr to James Dixon £1152				
14	Caſh, received for myſelf and F. V. Dyke -	864 0 0			
9	Profit and Loſs for my abatement - -	250 0 0			
15/8	F. V. Dykes Account of goods, for his ditto -	38 0 0			
			1152	0	0
	———— 8 ————				
	***Madeira in Co. with Edm. Ellis and Nich. Norton Dr to Geo. Emerſon* £450**				
19/19	F 18 pipes at 25l - -		450	0	0
	———— 9 ————				
	***Caſh Dr to William Lawſon* £40 16 8**				
14/12	Received of him in full - -		40	16	8
	———— 11 ————				
	Geo. Emerſon Dr to Sundries £450				
19/18	To Edm. Elllis, for goods accounted with him -	94 0 0			
19	To Nich. Norton, accounted with him for -	170 0 0			
14	To Caſh, paid by me -	186 0 0			
			450	0	0
19	*Sundries Drs to Edmund Ellis* £56 0 0				
14	Nich. Norton, paid to him	20 0 0			
18	Caſh, paid to me -	36 0 0			
			56	0	0

November

			l	s	d
	——— November 12, 1789 ———				
	William Wright Dr to Madeira in Co. with Edm. Ellis and N. Norton £108 0 0				
20 19	For 4 pipes at 27l - -		108	0	0
	——— 13 ———				
	Sundries Dr to Madeira in Co with E. Ellis and N. Norton £84 0 0				
14	Caſh, in part for 3 pipes at 28l	34 0 0			
20 19	James Thompſon, reſt at 10 days	50 0 0	84	0	0
	——— 15 ———				
20 19	*Canary in Co. with E. Ellis and N. Norton Dr to Madeira in Co. with Ditto £308*				
	For 14 pipes at 22l received in barter for 11 pipes at 28l - -		308	0	0
	——— 16 ———				
	Caſh Dr to William Wright £108 0 0				
14 20	Received for Madeira -		108	0	0
	——— 19 ———				
	James Horton Dr to Caſh £117 12 0				
12 14	Paid him in full for T. Janſen's druggets		117	12	0
	——— 23 ———				
	Sundries Drs to James Thompſon £50				
14	Caſh, received Compoſition	30 0 0			
19 20	Madeira in Co. with E. Ellis and N. Norton, allowed him	20 0 0	50	0	0
	——— 27 ———				
	Thomas Young Dr to Cochineal £130				
11 10	For 1 cwt - - -		130	0	0
	——— 29 ———				
	Caſh Dr to Canary in Co. with E. Ellis and N. Norton £50				
14 20	For 2 pipes at 25l -		50	0	0

December

			l	s	d
	——December 5, 1789——				
	Sundries Drs to Canary in Co. with E. Ellis and N. Norton £264 0 0				
18	E. Ellis, for 4 pipes taken as his ſhare	88			
19	N. Norton, for 4 ditto -	88			
21	Canary, for my 4 ditto at 22l	88			
20			264	0	0
	6				
	James Conyers, my Account Current Dr to Voyage to Hamburgh £392 6 8				
21/15	For neat proceeds of my adventure, 676l 15s 6d Flemiſh, exchange at 34s 6d		392	6	8
	14				
	Timothy Clarkſon Dr to Scotch Linen £70 16 8				
6/7	For 500 yds at 2s 10d -		70	16	8
	18				
	Bills receivable Dr to James Conyers my Account Current £396 3 2½				
11/21	Remitted me in full, exchange at 34s 2d in bills, viz				
	One on Charles Coke, for	300 0 0			
	One on William Webſter, for	96 3 2½			
			396	3	2½
	24				
	Caſh Dr to Ship Swallow in Co. with Sam. Edwards £25				
14/17	For freight of ſaid ſhip of Nicholſon and Co. - - -		25	0	0
	26				
	Nicholſon and Co. Dr to Ship Swallow in Co. with Sam. Edwards £1000 0 0				
21/17	For the ſaid ſhip ſold them payable in 3 months - - -		1000	0	0
	28				
	Profit and Loſs Dr to Caſh £91 2 8				
9/14	For houſe, &c expences till Chriſtmas		9	2	8

LEDGER

LEDGER, 1789.

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(1) 1789 *Dr* *Stock* *Cr* 1789

		fol	l	s	d			fol	l	s	d
Jan. 1	To Sundries, as per journal		272	14	6		By Sundries, as per journal		3333	6	0
	To Balance, my neat worth	22	8666	17	0		By Pr. and Loſs, gain this yr	23	606	5	6
			8939	11	6				8939	11	6

Dr *Caſh* *Cr*

		fol	l	s	d			fol	l	s	d
Jan. 1	To Stock - -	1	5000	0	0	Jan. 4	By Shalloon -	5	25	0	0
17	To Linen - -	2	23	15	0	7	By Edward Young -	4	120	0	0
Mar. 4	To William Johnſon	4	200	0	0	17	By Charles Wilſon, Eſq.	4	87	4	0
14	To Sugar - -	3	100	0	0	Feb. 6	By voyage to Jamaica	7	41	4	2
April 5	To Ship Endeavour	3	94	13	8	8	By Scotch Linen -	7	50	0	0
6	To I Onſlow -	5	355	10	0	27	By Thomas Draper -	7	472	0	0
24	To Liſbon Wine -	6	52	10	0	Mar. 7	By James Dixon -	8	1000	0	0
May 3	To Sugar -	3	66	0	0	27	By William Mercer -	5	15	10	6
17	To Profit and Loſs -	9	12	10	0	30	By Profit and Loſs -	9	93	4	10
25	To Timol. Janſen's Acc. Cur.	12	250	0	0	Apr. 15	By Tim. Clarkſon -	6	34	8	0
June 3	To David Robinſon	8	51	4	0	May 8	By Timol. Janſen's Acc. Cur.	12	184	18	7
7	To Bills Receivable	11	50	0	0	July 8	By Profit and Loſs -	9	130	0	0
July 23	To Voyage from Jamaica	13	70	0	0	23	By Voyage from Jamaca	13	83	4	8
							By Caſh, carried to -	14	3989	7	11
			6326	2	8				6326	2	8

July 23	To Voyage from Jamaica							By Cash, carried to -		14	3989	7	11
				6326	2	8					6326	2	8

(2) 1789 *Dr* *Broad Cloth* *Cr* 1789.

1789	*Dr*	yd	fol	l	s	d	1789	*Cr*	yds	fol	l	s	d
Jan. 1	To Stock, at 15s a yd	300	1	225	0	0	Feb. 2	By Tho. Draper, at 18s	100	7	90	0	0
Mar 22	To I. Onflow, at 12s 6d	500	5	312	10	0	6	By Voy. to Jamaica, at 15s	200	7	150	0	0
		800					Apr 2	By Indian Chints, at 14s	300	10	210	0	0
							May 8	By T. Janſen's Account Current, at 14s	200	12	140	0	0
	To Profit and Loſs, gained		9	52	10	0			800		590	0	0
				590	0	0							

	Dr	yds		*Linen*				*Cr*	yd				
Jan. 1	To Stock, at 2s 6d a yd	1200	1	150	0	0	Jan. 17	By caſh, at 3s 2d a yd	150	1	23	15	0
							Feb. 6	By Voyage to Jamaica at 2s 6d	800	7	100	0	0
	To Profit and Loſs, gained		9	11	5	0	May 1	By Tho. Young, at 3s	250	11	37	10	0
				161	5	0			1200		161	5	0

	Dr	tons		*Lead*				*Cr*	tons				
Jan. 1	To Stock, at 16l a ton	44	1	704	0	0	Mar. 9	By C. Wilſon Eſq at 19l	20	4	380	0	0
							Apr. 9	By Sundries, at 18l -	15	10	270	0	0
	To Profit and Loſs, gained		9	108	0	0	May 1	By Tho. Young, at 18l	9	11	162	0	0
				812	0	0			44		812	0	0

(3) 1789 *Dr* *Rum* *Cr* 1789

		pch	fol	l	s	d			p h	fol	l	s	d
Jan. 1	To Stock, at 38l per pun	25	1	950	0	0	Jan. 30	By Liſbon Wine, at 40l	5	0	200	0	0
July 25	To Voyage from Jamaica, at 23l	7	13	161	0	0	Feb. 12	By Iſaac Onflow, at 44l	20	5	880	0	0
	To Profit and Loſs, gained		9	130	0	0		By Balance at 23l	7	22	161		0
		32		1241	0	0			32		1241	0	0
	Dr			*Su-*			*gar*	*Cr*	cw				
		cwt					Mar. 14	By Sundries, at 56s	54		151	4	0
	To Stock -	140					May 3	By Sundries, at 58s	40		116	0	0
Jan. 1	To Profit and Loſs, gained		1	304	6	0	Aug. 6	By Dyke's Ac. Cur. at 56s	46	15	128	16	0
			9	91	14	0							
									140		396	0	0
				396	0	0							
	Dr *Ship*							*Endeavour* *Cr.*					
Jan. 1	To Stock, for $\frac{3}{8}$ -		1	300	0	0	April 5	By Caſh, for my ſhare gained		1	94	13	8
	To Profit and Loſs, gained		9	153	6	10	Sep. 30	By Caſh, for ditto		14	58	13	2
								By Balance, remaining $\frac{3}{8}$		22	300	0	0
				453	6	10					453	6	10

(4) 1789	Dr.	fol	l	s	d	William	Johnſon 1789 Cr	fol	l	s	d
Jan. 1	To Stock -	1	200	0	0	Mar. 4	By Caſh, in full -	1	200	0	0
June 7	To Holland -	8	240	0	0		By Balance, due by him	22	240	0	0
			440	0	0				440	0	0
	Dr James						Gibſon Cr				
Jan. 1	To Stock -	1	500	0	0	Nov. 4	By Caſh, received -	14	500	0	0
July 4	To Pro. and Loſs, for a legacy	9	300	0	0		By Balance, due by him	22	300	0	0
			800	0	0				800	0	0
	Dr Edward						Young Cr				
Jan. 7	To Caſh, in full -	1	120	0	0	Jan. 1	By Stock -	1	120	0	0
July 13	To Abel Factor, my acc. cur.	13	219	3	2½	July 30	By Caſh, in full -	14	219	3	2½
			339	3	2½				339	3	2½
	Dr Charles						Wilſon Eſq. Cr				
Jan. 17	To Caſh, in full -	1	87	4	0	Jan. 1	By Stock -	1	87	4	0
Mar. 9	To Lead -	2	380	0	0	Feb. 8	By Scotch Linen -	7	75	0	0
							By Balance, due by him	22	305	0	0
			467	4	0				467	4	0

(5)	1789 Dr.						William Mercer	Cr. 189					
			fol	l	s	d				fol	l	s	d
Feb. 19	To Iſaac Onſlow -		5	50	0	0	Jan. 1	By Stock - -		1	65	10	6
Mar 27	To Caſh, in full -			15	10	6							
				65	10								
	Dr	yds		Shalloon				Cr					
Jan. 4	To Caſh, at 1s 3d a yd	400	1	25	0	0			yds				
	To Profit and Loſs, gained		9	3	6	8	May 13	By Suſpence Ac. at 1s 5d	400	12	28	6	8
				28	6	8							
	Dr	Oporto						Wine Cr	hhds				
Jan. 12	To I. Onſlow, at 9l a hhd.	18h	5	162	0	0	Sep. 24	By Bills Rec. at 10l for	12	11	120	0	0
	To Profit and Loſs, gained		9	12	0	0		By Balance, rem. at 9l.	6	22	54	0	0
									18				
				174	0	0					174	0	0
	Dr	Iſaac						Onſlow Cr					
							Jan. 12	By Oporto Wine -		5	162	0	0
Feb. 12	To Rum - -		3	880	0	0	Feb. 19	By William Mercer		5	50	0	0
							Mar. 2	By Broad Cloth -		2	312	0	0
							April 9	By Caſh, in full -		1	35	0	0
											880	0	0

Mar. 2.	By Broad Cloth	-	2	312	0	0
April 9	By Cash, in full	-	1	35	0	0
				880	0	0

(6)

1789	Dr						Hops	Cr					1789
		c qr	fol	l	s	d			c qr	fol	l	s	d
Jan. 24	To Tim. Clarkson, at 46s a cwt	40 2	6	93	3	0	Mar 14	By T. Clarkson, at 50s.	23 2	6	58	15	0
	To Profit and Loss, gained		9	4	14	0		By Balance, rem. at 46s.	17 0	22	39	2	0
				97	17	0			40 2		97	17	0

	Dr	Timothy					Clarkson	Cr					
Mar. 14	To Hops	-	6	58	15	0	Jan. 24	By Hops	-	6	93	3	0
Apr. 15	To Cash in full	-	1	34	8	0		By Balance, due by him		22	70	16	8
Dec. 14	To Scotch Linen	-	7	70	16	8							
				163	19	8					163	19	8

	Dr	Lisbon					Wine	Cr					
		hhds							hds				
Jan. 30	To Rum, at 10l a hhd	20	3	200	0	0	Apr. 24	By Sundries, at 11l 10s	15		172	10	0
	To Profit and Loss, gained		23	22	10	0		By Balance, rem. at 10l	5	21	50	0	0
				222	10	0			20		222	10	0

1789	Dr	yds	fol	l	s	d		Cr	yds	fol	l	s	d
	Thomas Draper												
Feb. 2	To Broad Cloth -		2	90	0	0	Feb. 6	By Voyage to Jamaica		7	152	0	0
27	To cash, in full -		1	472	0	0	8	By Scotch Linen -		7	50	0	0
							23	By Holland -		8	360	0	0
				562	0	0					562	0	0
	Dr *Voyage to Jamaica* Cr												
Feb. 6	To Sundries, as per Journal			443	4	2	June 28	By Abel Factor, my Account Current		13	567	12	4½
	To Profit and Loſs, gained		23	12	8	2½							
				567	12	4½							
	Dr *Scotch Linen* Cr												
Feb. 8	To Sundries, at 2s 4d	1500		175	0	0	May 13	By Suſp. Acct. at 2s 6d	1500	12	125	0	0
June 19	To Suſpence Account at 2s 6d	500	12	62	10	0	Dec. 14	By T. Clarkſon, at 2s 10d	500	6	70	16	8
		2000						By Balance rem, at 2s 4d	500	12	58	6	8
	To Profit and Loſs, gained		23	16	13	4			2000				
				254	2	4					254	3	4

1789	Dr Holland	pcs	fol	l	s	d	1789	Holland Cr	p	fo	l	s	d
Feb. 23	To Tho. Draper, at 181	20	7	360	0	0	June 7	By Wm. Johnson, at 20l	12	4	240	0	0
	To Profit and Loſs, gained		23	24	0	0	Nov. 2	By voyage to Liſbon in Co with E. Ellis and N. Norton, at 18l.	8	18	144	0	0
				384	0	0			20		384	0	0
	Dr James							Dixon Cr.					
Mar. 7	To Caſh lent him -		1	1000	0	0	Nov. 6	By Sundries -			1152	0	0
Aug 14	To F. V. Dyke's Acc. of goods		15	152	0	0							
				1152	0	0							
	Dr David							Robinſon Cr					
Mar. 14	To Sugar, due in 2 months		3	51	4	0	June 3	By Caſh in full -		1	51	4	0
July 23	To Voyage from Jamaica due in 6 months		13	70	0	0		By Balance due by him		22	70	0	0
				121	4	0					121	4	0

(9) 1789 *Dr* *Profit and Loſs* *Cr* 1789

		fol	l	s	d			fol	l	s	d
Mar. 30	To Caſh, for houſe expen. &c	1	93	4	10	May 8	By T. Janſen's Acc. Current	12	11	1	3
July 8	To Caſh, for houſe expen. &c	1	130	0	0	17	By Caſh, for intereſt of 500	1	12	10	0
Oct. 8	To Caſh, houſe, &c expences	14	110	3	4	July 4	By Ja. Gibſon, for a legacy	4	300	0	0
Nov. 6	To James Dixon, allowed	8	250	0	10	Aug. 17	By F.V. Dyke's Acc. of goods	15	7	10	6
Dec. 28	To Caſh, houſe, &c expences	14	91	2	8	26	By F.V. Dyke's Acc. Current	15	4	8	10
						Sept. 9	By Caſh, for intereſt	14	25	0	0
						Oct. 30	By Tobacco, in Co. with—S. Edwards—	16	3	10	11
						Nov. 4	By Caſh, for intereſt of 500l	1	12	10	0
							By Broad Cloth, gained	2	52	10	0
							By Linen, gained -	2	11	5	0
							By Lead, gained -	[illegible]	108	0	0
							By Rum, gained -	3	130	0	0
							By Sugar, gained -	3	91	14	0
							By Ship Endeavour, gained	3	153	6	10
							By Shalloon, gained	5	3	6	8
							By Oporto Wine, gained	[illegible]	12	0	0
							By Hops, gained -	6	4	14	0
	To Profit and Loſs, carried to	23	268	17	2						
			943	8	0				943	8	0

(10) 1789 **Dr** *Indian Chintz* **Cr** 1789

1789		pcs	fol	l	s	d	1789		pc	fo	l	s	d
Apr. 2	To Broad Cloth, at 21l for	10	2	210	0	0	Sep. 20	By Voy. to Hamburgh, at 21l for	10	15	210	0	0

Dr *Tea* **Cr**

		lb	fol	l	s	d			lb	fo	l	s	d
Apr. 9	To Lead, at 12s a lb for	200	2	120	0	0		By Balance rem. at 12s	200	22	120	0	0

Dr *Muſlin* **Cr**

		bales	fol	l	s	d			bales	fo	l	s	d
Apr. 9	To Lead at 12l 10s a bale for	12	2	150	0	0	O8.	By Sundries, at 12l 10s for	12	16	150	0	0

Dr *Cochineal* **Cr**

			fol	l	s	d				fo	l	s	d
Apr. 24	To Liſbon Wine, for 1 cwt		6	120	0	0	Nov. 27	By Tho. Young, for 1 cwt		11	130	0	0
	To Profit and Loſs, gained		23	10	0	0							
				130	0	0							

1789	Dr.	fol	l	s	d	1789	Cr.	fo	l	s	d
(11)	*Thomas Young*										
May 1	To Sundries -	2	190	10	0	May 1	By Sundries -		170	15	0
Nov 27	To Cochineal -	10	130	0	0		By Balance, due by him	22	158	15	0
			329	10	0				329	10	0
	Dr lb		*Cin-*			*namon*	*Cr* lb				
May 1	To Tho. Young, at 8s 4d 120	11	50	0	0		By Balance, rem. at 8s 4d 120	22	50	0	0
	Dr		*Cot-*			*ton*	*Cr*				
May 1	To Tho. Young, at— c qr 3l 10s— 34 2	11	120	15	0	Sep. 20	By Voyage to Hamburg, at 3l 12s } c qr 34 2	15	120	15	0
	Dr *Bills*						*Receivable* *Cr*				
May 3	To Sugar, 1 on Sam. Ward for	3	50	0	0	June 7	By Cash, received -	1	50	0	0
Sep. 24	To Op. Wine, 1 on W. Jones	5	120	0	0	Oct. 4	By Cash, for Wm. Jones's bill	14	120	0	0
Oct. 21	To Wm. Anderson my Acc. in Co. 1 on Geo. Drake	16	50	0	0		By Balance, remains 1 on Geo. Drake, for 50 0 0 1 on Cha. Cooke, for 300 0 0 1 on W. Webster, for 96 3 2½	22	446	3	2½
Dec. 18	To Ja. Conyers my Acc. Cur. One on Cha. Cooke, for	21	300	4	0						
	One on Wm. Webster, for	21	96	0	2½						
			616	3	2½				616	3	2½

	616	3	2½	
22	446	3	2½	
	616	3	2½	

(12) 1789 **Dr** *Timoleon Janſen's Account Current* **Cr** 1789

1789		fol	l	s	d	1789		fol	l	s	d
May 8	To Sundries -		453	11	10	May 25	By Caſh -	1	250	0	0
							By Balance due by him	22	203	11	10
									453	11	10
	Dr *James*						*Horton* *Cr*				
Nov 19	To Caſh, in full -	14	117	12	0	May 8	By T. Janſen's Acc. Current	12	117	12	0
	Dr *Suſpence*						*Account* *Cr*				
May 13	To Sundries, ſent W. Lawſon		153	6	8	June 19	By Sundries .		153	6	8
	Dr *William*						*Lawſon* *Cr*				
June 19	To Suſpence Account	12	90	16	8	Aug. 7	By Caſh, in part -	14	50	0	0
						Nov. 9	By Caſh, in full -	14	40	16	8
									90	16	8

(13) 1789 **Dr** *Abel Factor, my Account Current* **Cr** 1789

1789	Dr	fol	l	s	d	1789	Cr	fol	l	s	d
June 28	To Voyage to Jamaica, for neat proceeds	7	567	12	4½	June 28	By Voyage from Jamaica, for goods returned	13	348	9	2
						July 13	By Edw. Young, for my bill	4	219	3	2½
									567	12	4½

Dr *Voyage from Jamaica* *Cr*

	Dr	fol	l	s	d		Cr	fol	l	s	d
June 28	To Abel Factor my Account Cur. for goods returned	13	348	9	2	July 23	By Sundries, as per journal		140	0	0
July 23	To Cash, for freight, duty, &c	1	83	4	8	25	By Sundries brought into my warehouse		273	10	0
							By Profit and Loss -	13	18	3	0
			431	13	10				431	13	10

Dr *Indigo* *Cr*

	Dr	lb	fol	l	s	d		Cr	lb	fol	l	s	d
July 25	To Voyage from Jamaica, at 2s 3d	1000	13	112	10	0		By Balance, rem. at 2s 3d	1000	22	112	10	0

July 25	To Voyage from Jamaica, at 2s 3d	1000	13	112	10	0
	By Balance, rem. at 2s 3d	1000	22	112	10	0

(14) 1789 **Dr** *Caſh* *Cr.* 1789

1789		fol	l	s	d
	To Caſh, brought from	1	3989	7	11
July 30	To Edward Young -	4	219	3	2½
Aug. 7	To William Lawſon	12	50	0	0
10	To F. Van Dyke's Ac. of Goods	15	134	8	0
Sept. 9	To Profit and Loſs -	9	25	0	0
30	To Ship Endeavour	3	58	13	2
Oct. 4	To Bills receivable -	1	120	0	0
12	To William Anderſon	16	75	0	0
21	To W Anderſon, my Ac. in Co.	16	53	7	4
24	To Ship Swallow in Co. with Sam. Edwards	17	25	0	0
25	To Tobacco in Co. with ditto	6	98	0	0
Nov. 4	To Sundries -		512	10	0
6	To James Dixon -	8	864	0	0
9	To William Lawſon	12	40	16	8
11	To Edmund Ellis -	18	30	0	0
13	To Madeira in Co. with E. Ellis and N Norton	19	84	0	0
16	To William Wright	20	108	0	0
23	To James Thompſon	20	30	0	0
29	To Canary in Co.	20	50	0	0
Dec. 24	To Ship Swallow in Co. with S. Edwards	17	5	0	0
			6548	6	3½

1789		fol	l	s	d
Aug. 2	By F. Van Dyke's Ac. of Goods	15	12	14	6
17	By Ditto -	15	2	0	6
26	By Ditto -	15	48	1[illegible]	7
Sept. 2	By F. Van Dyke's Ac. Current	15	81	6	3½
20	By Voyage to Hamburgh	15	24	7	3
Oct. 8	By Profit and Loſs	9	110	3	4
14	By Wm. Anderſon my Ac. in Co.	16	72	0	0
15	By Ship Swallow in Co. with Sam. Edwards	17	460	0	0
21	By Ditto - -	17	13	10	0
25	By Ditto -	17	14	0	4
25	By Tobacco in Co. with ditto	16	2	7	3
28	By Adam Ainſley -	17	77	0	0
30	By Samuel Edwards -	17	7	10	1[illegible]
Nov. 2	By Voyage to Liſbon in Co. with E. Ellis & N. Norton	18	46	10	0
4	By Edmund Ellis -	18	47	10	0
11	By George Emerſon -	19	180	0	0
19	By James Horton -	12	117	1[illegible]	0
Dec. 28	By Profit and Loſs -	9	91	2	8
	By Balance, caſh in my hands	22	5133	6	3
			6548	6	[illegible]½

(15) 1789 Dr *Fred. Van Dyke's Account of Goods* Cr 1789

1789	Dr	fol	l	s	d	1789	Cr	f	l	s	d
Aug. 2	To Caſh for cuſt, freight, &c	4	12	14	6						
1	To Caſh, for ſtorage, &c	14	2	0	6						
—	To Profit and Loſs, for my commiſſion	9	7	10	6	Aug. 10	By Caſh, for his currants	14	134	8	0
Nov. 6	To James Dixon, allowed him	8	38	0	0	14	By Ja. Dixon, for his raiſins	8	152	0	0
	To ditto his Account Current in my hands	15	226	2	6				286	8	0
			286	8	0						

Dr *Fred Van Dyke's Account Current* Cr

	Dr	fol	l	s	d		Cr	f	l	s	d
Aug. 26	To ſundries -		182	3	5		By ditto his Acc. of Goods	15	226	2	6
Sept. 2	To Caſh, for a bill of 866 guilders	14	81	6	3½		By Balance, due to me	22	37	19	8½
			263	9	8½				263	9	8½

Dr *Voyage to Hamburgh* Cr

	Dr	fol	l	s	d		Cr	f	l	s	d
Sep. 20	To Sundries -		355	2	8	Dec. 6	By Ja. Conyers, my Ac. Cur.	21	392	6	8
	To Profit and Loſs, gained	23	37	4	0						
			392	6	8						

Dr *William Anderſon my Account in Co.* Cr 1789

(16) 1789 Dr *William Anderson my Account in Co.* Cr 1789

1789	Dr	fol	l	s	d	1789	Cr	fol	l	s	d
Oct. 8	To muslin, for my ½ share 12 bales	10	75	0	0						
14	To cash, for my ½ of 12 hhds tobacco	4	72	0	0	Oct. 21	B [illegible] received		193	7	4
	To Profit and Loss, gained	23	46	7	4						
			193	7	4						

	Dr *William*						*Anderson* Cr				
Oct. 8	To Muslin, for his ½ share 12 bales	10	75	0	0	Oct. 14	By Cash, received for his ½ share	14	75	0	0

	Dr *Tobacco in Co.*						*with* *Sam. Edwards* Cr				
Oct. 14	To Adam Ainsley, at 5l 10s 14 hhds	17	77	0	0						
25	To Cash, for carriage, &c	14	2	7	3						
30	To Profit and Loss, Commission	23	3	10	11	Oct. 25	By Cash, at 7l for 14 hhds	14	98	0	0
	To S. Edwards, his ½ gained	17	7	10	11						
	To Profit and Loss, my gain	23	7	10	11						
			98	0	0						

(17) 1789 *Dr* *Adam Ainſley* *Cr* 1789

1789		fol	l	s	d	1789		fol	l	s	d
Oct. 28	To Caſh, paid him in full	14	77	0	0	Oct. 14	By Tobacco in Co. with Sam. Edwards	16	77	0	0
	Dr *Ship Swallow in Co.*					*with*	*Sam. Edwards* *Cr*				
Oct. 16	To ſundries, coſt -		920	0	0	Oct. 24	By Caſh, for 1 month's freight	14	25	0	0
24	To Caſh, for inſurance	14	13	10	0	Dec. 24	By Caſh, for freight	14	25	0	0
25	To Caſh, for repairs	14	14	6	4	26	By Nicholſon and Co.	21	1000	0	0
	To Sam. Edwards, ½ gained	17	51	1	10						
	To Profit and Loſs, my gain	23	51	1	10				1050	0	0
			1050	0	0						
	Dr *Samuel*						*Edwards* *Cr*				
Oct. 30	To Caſh, paid him his ½ neat gain on tobacco	21	7	10	11	Oct. 16	By Ship Swallow in Co. for his ½ paid	17	460	0	0
	To Nicholſon and Co. ½ due to him	22	500	0	0		By tobac. in Co. for his ½ gained	16	7	10	11
	To Balance due to him		11	1	10		By Ship Swallow in Co. his ½ gained	17	51	1	10
			518	12	9				518	12	9

	To Balance due to him		11	1	10		½ gained	17	51	1	10
			518	12	9				518	12	9

(18) 1789 Dr Kerseys Cr 1789

		fol	l	s	d			fol	l	s	d
Oct. 21	To W. Anderſon, my Ac. in Co. at 6l for 15 pcs	18	90	0	0	Nov. 2	By Voyage to Liſbon in Co. with E. Ellis and N. Norton, at 6l for 15 pieces	20	90	0	0

Dr Voyage to Liſbon in Co with E. Ellis and N. Norton Cr

		fol	l	s	d			fol	l	s	d
Nov 2	To Sundries, for goods and charges		984	0	0		By E. Ellis his ⅓ remaining	18	328	0	0
							By N. Norton for one-third	19	328	0	0
							By Balance for one-third	22	328	0	0
									984	0	0

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Dr Edmund Ellis Cr

		fol	l	s	d			fol	l	s	d
Nov. 4	To Sundries -		159	10	0	Nov. 2	By Voyage to Liſbon in Co.	18	487	10	0
Dec. 5	To Canary in Co. -	20	88	0	0	11	By Geo. Emerſon, paid him	19	94	0	0
	To Voyage to Liſbon in Co.	18	328	0	0		By Sundries, paid by him	19	56	0	0
	To Balance, due to him	22	74	0	0		By Madeira in Co. ⅓ gained	19	10	0	0
							By Canary in Co. ⅓ gained	20	2	0	0
			649	10	0				649	10	0

(19) 1789 *Dr* *Nicholas Norton* *Cr* 1789

		fol	l	s	d			fol	l	s	d
Nov. 11	To E. Ellis, paid him	18	20	0	0	Nov. 2	By Voyage to Liſbon in Co	18	210	0	0
Dec. 5	To Canary in Co. -	20	88	0	0	4	By Edm. Ellis -	18	112	0	0
	To Voyage to Liſbon in Co. for one third remaining	8	328	0	0	11	By Geo. Emerſon -	19	170	0	0
	To balance, due to him	2	74	0	0		By Madeira in Co. for $\frac{1}{3}$ gained	19	10	0	0
							By Canary in Co. for $\frac{1}{3}$ gained	20	2	0	0
			510	0					510	0	0

Dr *Madeira in Co. with E. Ellis and N. Norton* *Cr*

		pp.	fol	l	s	d			pipes	fol	l	s	d
Nov. 8	To G. Emerſon, at 25l for	18	19	450	0	0	Nov. 12	By W. Wright, at 27l for	4	20	108	0	0
23	To James Thompſon, allowed		2	20	0	0	13	By Sundries, at 28l for	3		84	0	0
	To E. Ellis, for his $\frac{1}{3}$ gained		18	10	0	0	15	By Canary in Co. with ditto, at 28l for	11	20	308	0	0
	To N. Norton, for his $\frac{1}{3}$ ditto		19	10	0	0			18		500	0	0
	To Profit and Loſs, my $\frac{1}{3}$ ditto		23	10	0	0							
				500	0	0							

Dr *George Emerſon* *Cr*

		fol	l	s	d			fol	l	s	d
Nov. 11	To ſundries -		450	0	0	Nov. 8	By Madeira in Co. with E. Ellis and N. Norton	19	450	0	0

(20) 1789 *Dr* *William Wright* *Cr* 1789

1789		fol	l	s	d	1789		fol	l	s	d
Nov.12	To Madeira in Co. with E. Ellis and N. Norton	9	108	0	0	Nov.16	By Caſh, in full -	14	108	0	0

Dr *James Thompſon* *Cr*

		fol	l	s	d			fol	l	s	d
Nov.13	To Madeira in Co. with E. Ellis and N. Norton	19	50	0	0	Nov 23	By Sundries -		50	0	0

Dr Canary in Co. with E. Ellis and N. Norton *Cr*

		fol	l	s	d			fol	l	s	d
Nov.15	To Madeira in Co. with ditto, at 22l for 14 pipes	19	308	0	0	Nov 2[illegible]	By Caſh, at 25l for 2 pieces	14	50	0	0
	To E. Ellis, his 1-third gained	18	2	0	0	Dec. 5	By Sundries, at 22l for 12 pipes		264	0	0
	To N. Norton, his 1-third ditto	9	2	0	0						
	To P and Loſs, my 1-third ditto	23	2	0	0						
			314	0	0				314	0	0

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(21)

1789	Dr Canary	fol	l	s	d	1789	Canary Cr	fol	l	s	d
Dec. 5	To Canary in Co. at 22l for 4 pipes	20	88	0	0		By Balance, rem. at 22l. for 4 pipes	22	88	0	0

	Dr *James Conyers* my					*Account*	*Current* Cr				
Dec. 6	To Voyage to Hamburgh	15	392	6	8	Dec. 18	By Bills receivable	11	396	3	2½
	To Profit and Loſs, gain by exchange	23	3	16	6½						
			396	3	2½						

	Dr *Nicholſon* and					*Com-*	*pany* Cr				
Dec. 26	To Ship Swallow in Co. with Sam. Edwards	17	1000	0	0		By Sam. Edwards, ½ due to him	17	500	0	0
							By Balance, ½ due to me	22	500	0	0
									1000	0	0

(22) 1789 *Dr* *Balance* *Cr* 1789

1789 *Dr*					*Cr* 1789	fol	l	s	d
To Caſh, in my hands	14	5133	6	3					
To Rum, rem. 7 punch. at 23l	3	161	0	0					
To Ship Endeavour, for 3-8ths	3	300	0	0					
To Wm Johnſon, due by him	4	240	0	0					
To James Gibſon, due by him	4	300	0	0	By Sam. Edwards, due to him	17	11	1	10
To Cha. Wilſon Eſq. due by him	4	305	0	0	By E. Ellis, due to him	18	74	0	0
To Oporto Wine, 6 hhds at 9l	5	54	0	0	By N. Norton, due to him	19	74	0	0
To Hops rem. 17 cwt at 46s	6	39	2	0					
To Tim. Clarkſon, due by him	6	70	16	8					
To Liſ. Wine, rem. 5 hhds at 10l	6	50	0	0					
To Scotch Lin. 500 yds at 2s 4d	7	58	6	8					
To David Robinſon, due by him	8	70	0	0					
To Tea, rem. 200lb at 12s	10	120	0	0					
To Tho. Young, due by him	11	158	15	0					
To Cinnam. rem. 120lb at 8s 4d	11	50	0	0					
To Bills receiv. 1 on Geo. Drake		50	0	0					
1 on Cha. Cooke		300	0	0					
1 on Wm. Webſter		96	3	2½					
To T. Janſen's Ac. Cur. due by him	12	203	11	10					
To Indigo, rem. 125lb at 2s 3d	13	112	10	0					
To Dyke's Ac. Cur. due by him	15	37	7	2½					
To V. to Liſbon in Co. 1-3d rem.	18	328	0	0					
To Canary, rem. 4 pipes at 22l	21	88	0	0	By Stock, for my neat worth	1	8666	17	0
To Nicholſon and Co. due to me	21	500	0	0					
		8825	18	10			8825	18	10

(23) 1789 Dr *Profit and Loſs* Cr 1789

	fol	l	s	d		fol	l	s	d
To Voyage from Jamaica	13	18	3	10	By Profit and Loſs, brought from	9	268	7	2
					By Liſbon Wine, gained	6	22	10	0
					By Voyage to Jamaica, gained	7	124	8	2½
					By Scotch Linen, gained	7	16	13	4
					By Holland, gained -	8	24	0	0
					By Cochineal, gained	10	10	0	0
					By Voyage to Hamburgh, gained	15	37	0	0
					By W. Anderſon, my Account in Co, gained	16	46	7	4
					By Tobacco in Co. my ½ gained	16	7	10	11
					By Ship Swallow in Co. my ½ gained	17	51	1	10
					By Madeira in Co. my ⅓ gained	19	10	0	0
					By Canary in Co. my ⅓ gained	20	2	0	0
To Stock, neat gain this year	1	606	5	6	By J. Conyers my Acc. Current	21	3	6	6½
		624	9	4			624	9	4

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